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BRAKE CONTROL SYSTEM

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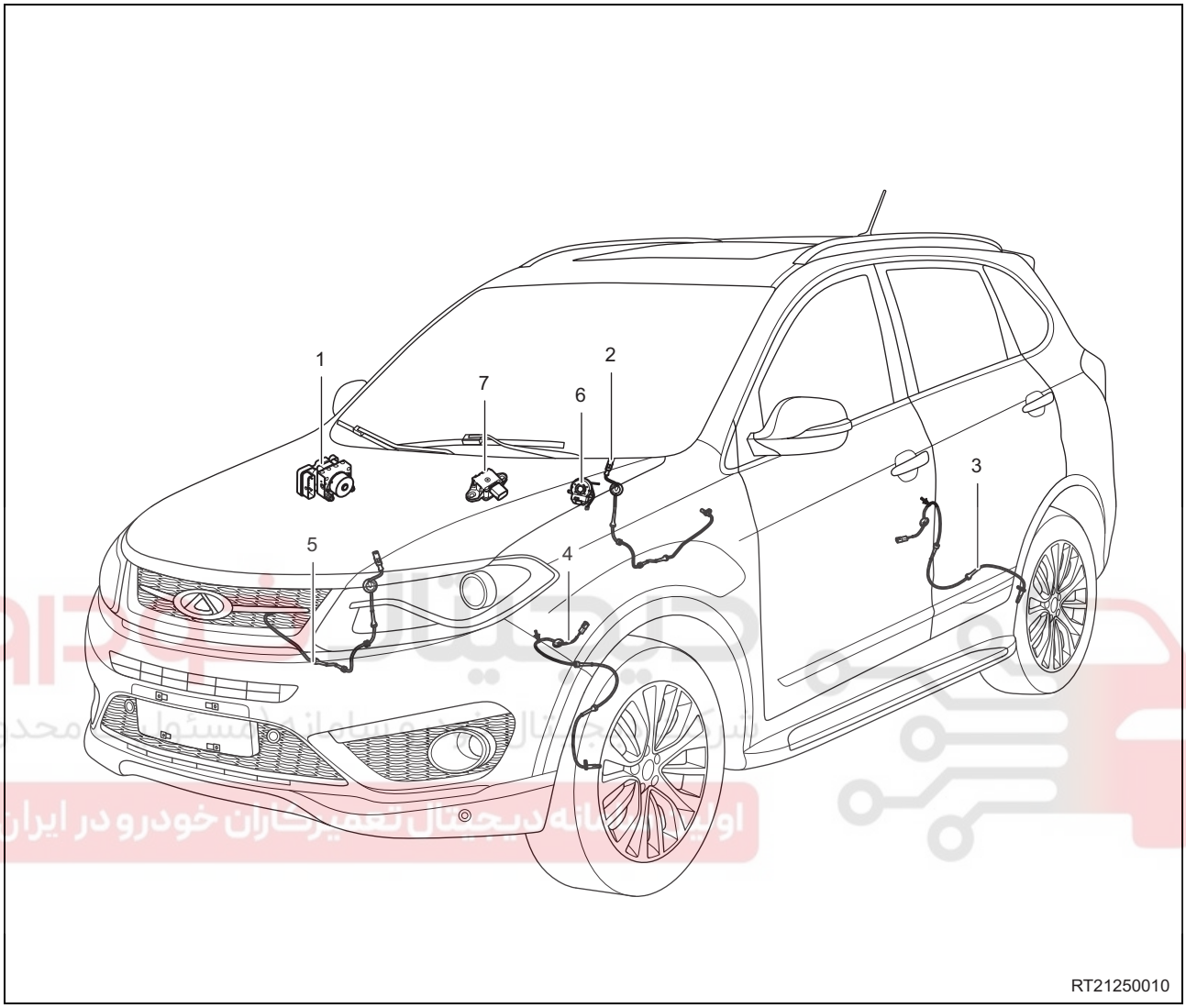
GENERAL INFORMATION

Description



1 - ABS/ESP Control Module Assembly	2 - Rear Right Wheel Speed Sensor
3 - Rear Left Wheel Speed Sensor	4 - Front Left Wheel Speed Sensor
5 - Front Right Wheel Speed Sensor	6 - Steering Angle Sensor

Brake control system equipped on this model is ABS (Anti-lock Brake System) + EBD (Electronic Brake Force Distribution) or ESP (Electronic Stability Program). It mainly consists of following components:

- ABS/ESP control module assembly (hydraulic control module and electronic control module)
- Wheel speed sensors (each wheel has one sensor)
- Steering angle sensor (if equipped with ESP)
- Yaw rate sensor (if equipped with ESP) (built in SRS control module assembly)

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Primary purpose of ABS is to prevent wheels from being locked during sudden braking. It has following effects:

1. Improving vehicle driving stability.
2. Improving vehicle steering ability.
3. Maintaining optimal brake pressure.
4. Shortening brake distance efficiently.

Operation

ABS Braking

1. If ABS system detects that wheels may be locked when applying brake, brake system will enter ABS braking mode. During braking, ABS/ESP control module outputs signals from each wheel speed sensor to each solenoid valve after analysis and processing in order to adjust fluid pressure in each line, to prevent wheels from being locked.
2. There are some operating symptoms of ABS/ESP that seem to be abnormal at first, but in fact they are normal. Symptoms are as follows:
   a. If electronic control module is malfunctioning, fail-safe function will be activated, ABS/ESP system will not operate and ABS/ESP warning light will come on.
   b. After vehicle is powered on or engine is started, short "buzz" sound can be heard. This is normal sound from ABS/ESP self-check.
   c. Motor, solenoid valve, and return pump movement in hydraulic unit will make noise when ABS/ESP is operating normally, but this is normal.
   d. Brake pedal may vibrate slightly and mechanical noise can be heard during ABS/ESP operation, but this is normal.
   e. Bumping sound between suspension and vehicle body can be caused by sudden braking.

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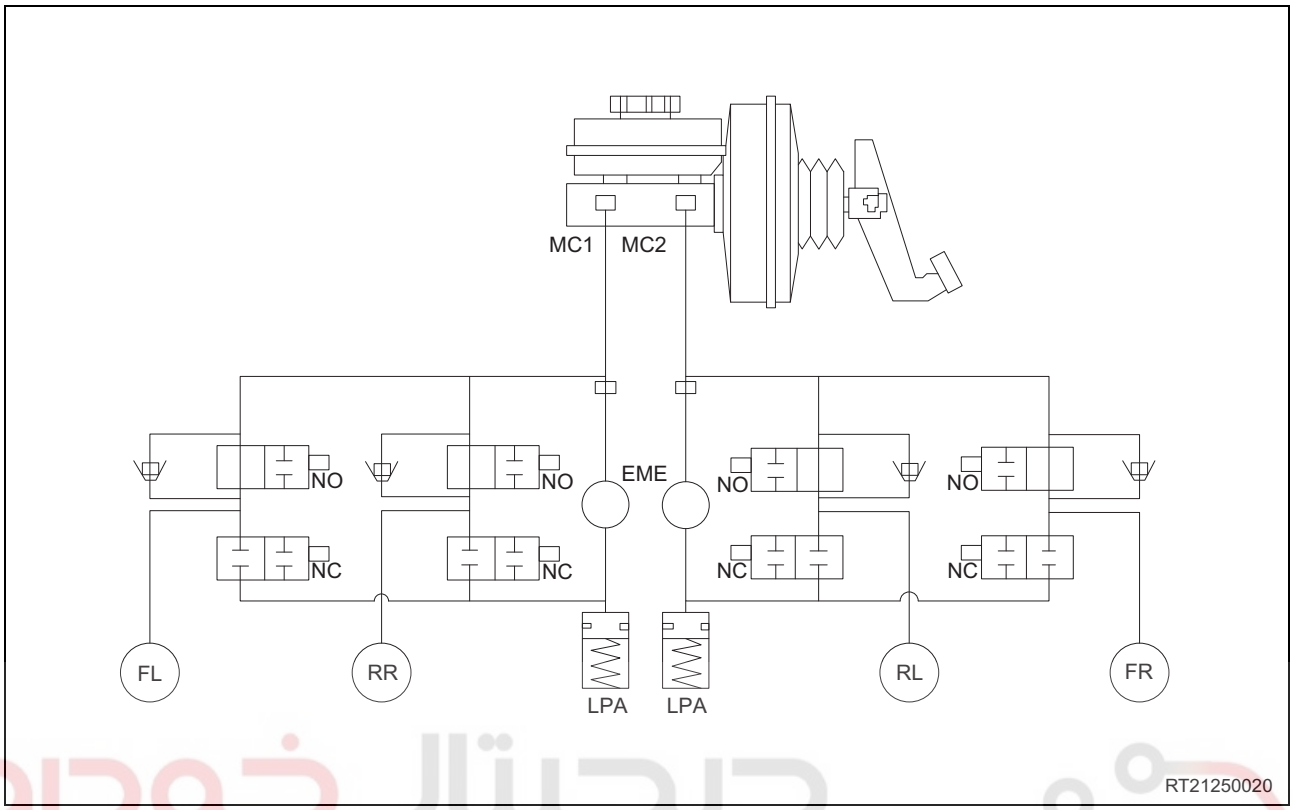
ABS Control Mode



Description	Definition	Description	Definition
MC1	Brake Master Cylinder Circuit 1	LPA	Low Pressure Accumulator
MC2	Brake Master Cylinder Circuit 2	FL	Front Left Wheel
EME	Return Pump	RR	Rear Right Wheel
NO	Normal Open (Solenoid Valve)	RL	Rear Left Wheel
NC	Normal Close (Solenoid Valve)	FR	Front Right Wheel

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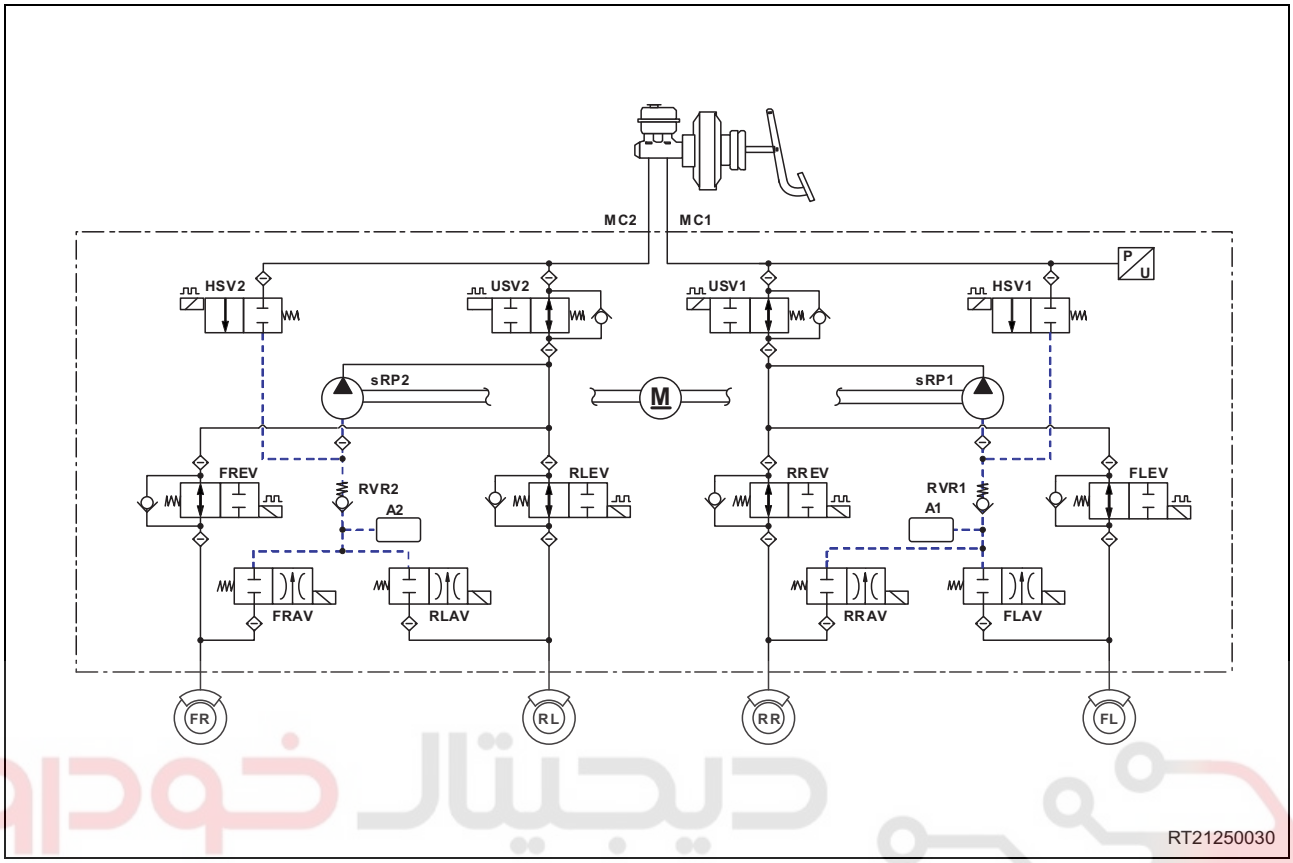
ESP Control Mode



Description	Definition	Description	Definition
MC1	Brake Master Cylinder Circuit 1	FLAV	Front Left Wheel Outlet Valve
MC2	Brake Master Cylinder Circuit 2	FREV	Front Right Wheel Inlet Valve
M	Motor	FRAV	Front Right Wheel Outlet Valve
RP1	Return Pump 1	RLEV	Rear Left Wheel Inlet Valve
RP2	Return Pump 2	RLAV	Rear Left Wheel Outlet Valve
A1	Accumulator 1	RREV	Rear Right Wheel Inlet Valve
A2	Accumulator 2	RRAV	Rear Right Wheel Outlet Valve
FL	Front Left Wheel	HSV1	High Pressure Valve 1
RR	Rear Right Wheel	HSV2	High Pressure Valve 2
RL	Rear Left Wheel	USV1	Guide Valve 1
FR	Front Right Wheel	USV2	Guide Valve 2
FLEV	Front Left Wheel Inlet Valve	P/U	Pressure Sensor

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1. Normal Brake Operating Condition

   For vehicles equipped with ABS, if brake pressure applied to wheels is not enough to lock wheels, fluid pressure generated by master cylinder will be transmitted to wheel cylinder through normal open valve, producing regular braking effect. When further braking is not necessary and driver reduces pressure acting on brake pedal, brake fluid of each wheel will return to master cylinder and brake pressure decreases.

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	OFF	OPEN
Normal Close Valve	OFF	CLOSE

2. ABS/ESP Operating (Relief) Condition

   For vehicles equipped with ABS/ESP, if brake pressure is applied excessively, friction coefficient between wheels and road will decrease, and wheels will decelerate earlier than vehicle would, which could cause wheels to lock first. In this case, ABS/ESP control module commands hydraulic control module to reduce wheel pressure. As a result, normal open valve shuts off its passage and the passage of normal close valve is opened, in order to reduce wheel cylinder pressure. At this time, brake fluid drained from wheel cylinder is temporarily stored in low pressure accumulator. Then, the brake fluid stored in low pressure accumulator returns to master cylinder with rotation of motor.

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	ON	CLOSE
Normal Close Valve	ON	OPEN

3. ABS/ESP Operating (Holding) Condition

   When appropriate pressure is applied to wheel cylinder, ABS/ESP system enters holding pressure state. As a result, normal open valve shuts off its passage and so does normal close valve, in order to maintain wheel cylinder pressure.

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	ON	CLOSE
Normal Close Valve	OFF	CLOSE

4. ABS/ESP Operating (Boost) Condition

   When ABS/ESP operates under relief pressure condition, if brake fluid is drained excessively or friction coefficient between wheels and road increases, it needs to increase each wheel pressure. In this case, ABS/ESP control module commands hydraulic control module to increase wheel pressure. As a result, normal open valve opens its passage and normal close valve shuts off passage, in order to increase wheel cylinder pressure. Brake fluid stored in low pressure accumulator is supplied to each wheel cylinder through master cylinder and normal open valve.

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	OFF	OPEN
Normal Close Valve	OFF	CLOSE

ABS system operates circularly among relief, holding and boost pressure conditions until vehicle is completely stopped, ensuring vehicle's braking and steering performances.

ESP adjustment procedure is similar to ABS adjustment procedure. While traction control and stability control are realized, HSV valve opens and USV valve closes to supply brake fluid through pump to wheel cylinders that need to increase pressure.

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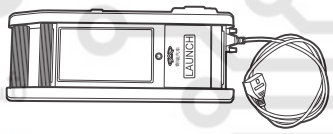
Specifications

Torque Specifications

Description	Torque (N·m)
Wheel Mounting Bolt	110 ± 10
Brake Pipe Coupling Plug	16 ± 2
ABS/ESP Control Module Assembly Mounting Bracket Fixing Bolt	23 ± 2
ABS/ESP Control Module Assembly Mounting Bracket Fixing Nut	23 ± 2
ABS/ESP Control Module Assembly Bottom Mounting Nut	8 ± 2
Front Wheel Speed Sensor Fixing Bolt	10 ± 1
Rear Wheel Speed Sensor Fixing Bolt	10 ± 1

Tools

Special Tool

X-431 3G Diagnostic Tester	 RCH0000001

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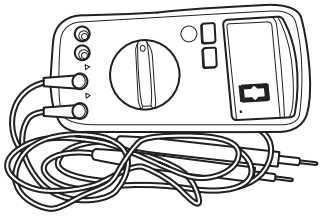
General Tool

Digital Multimeter	 RCH0000002

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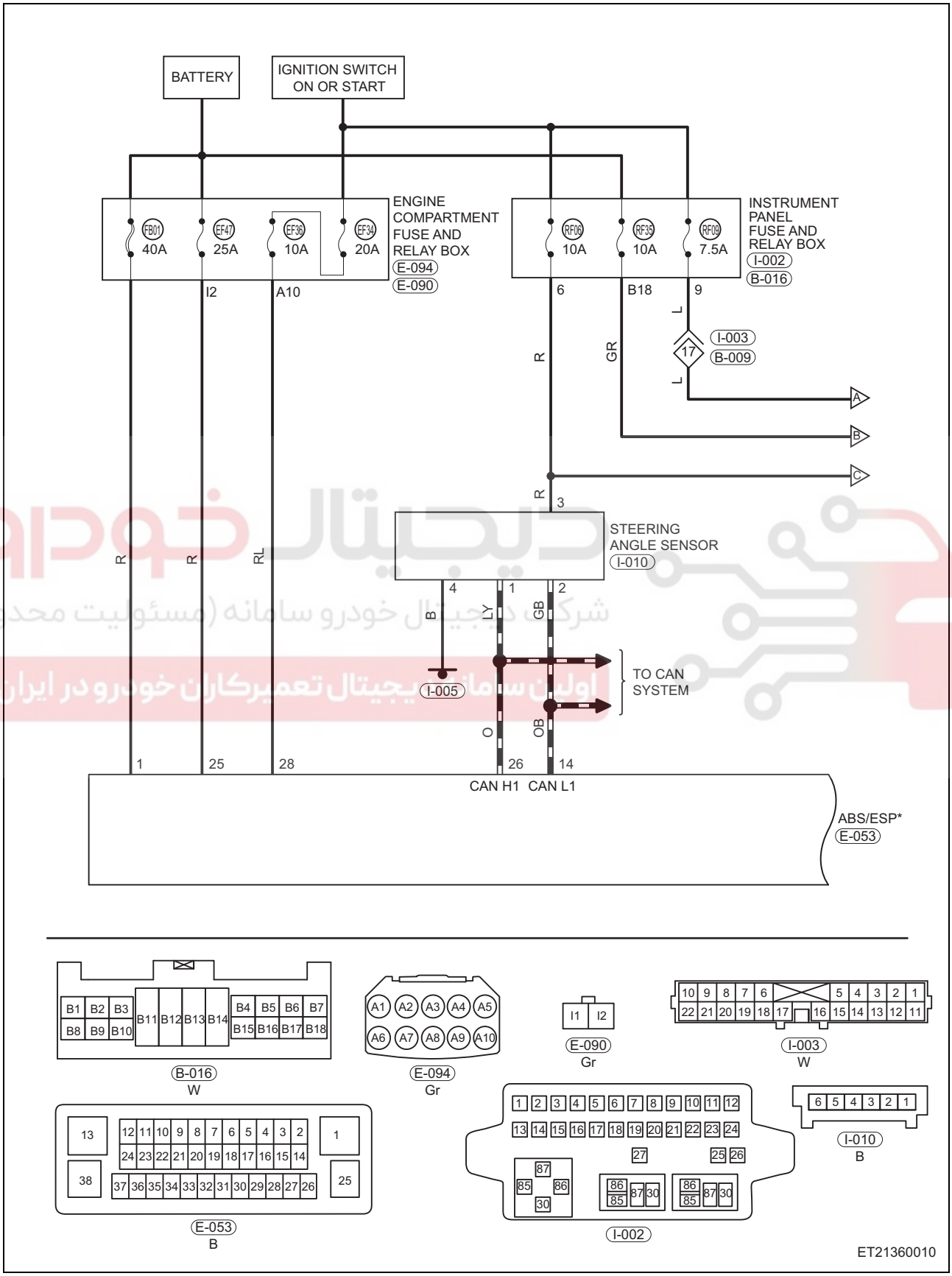
Circuit Diagram

Brake Control System (Page 1 of 3)



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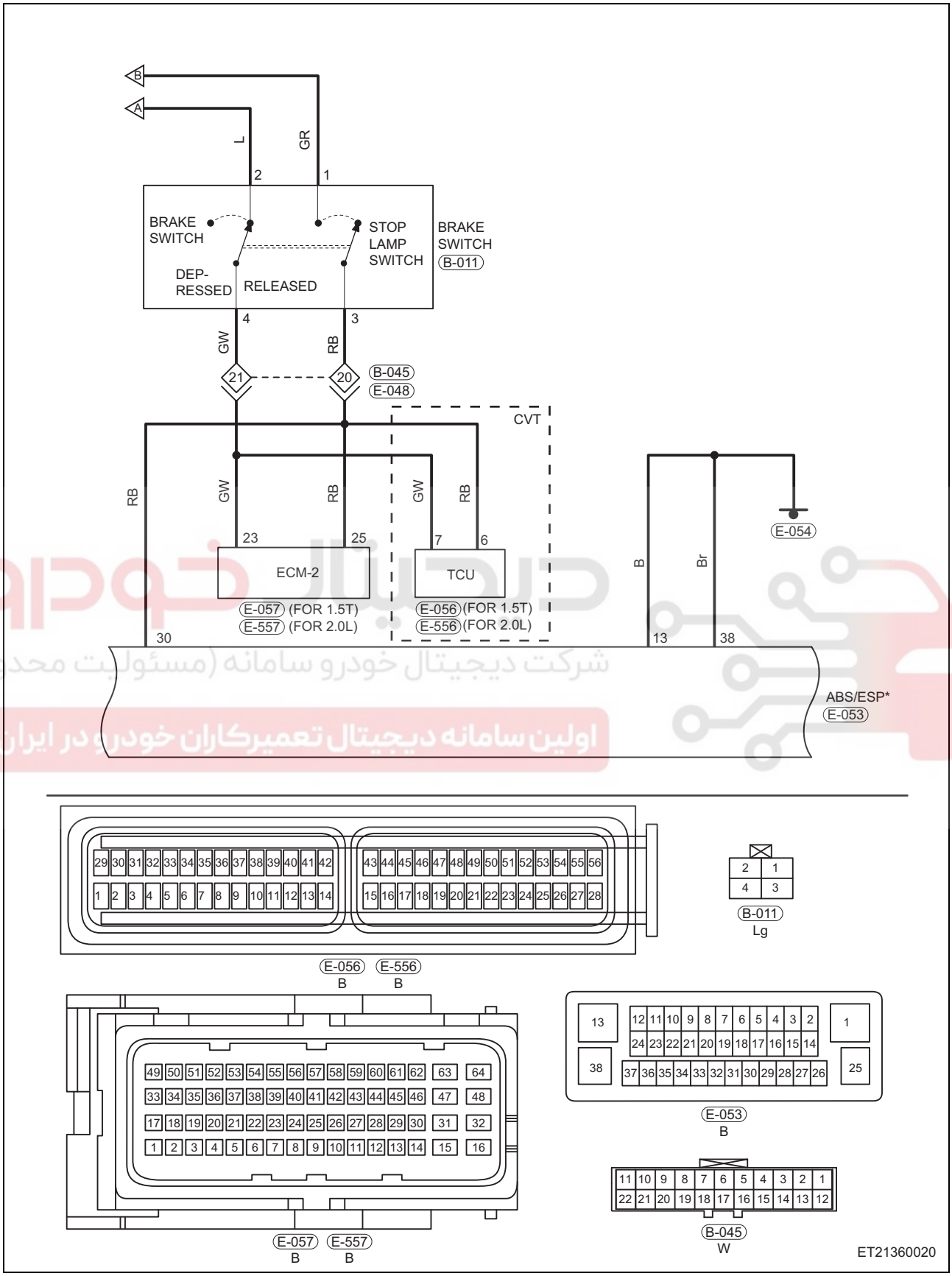
Brake Control System (Page 2 of 3)



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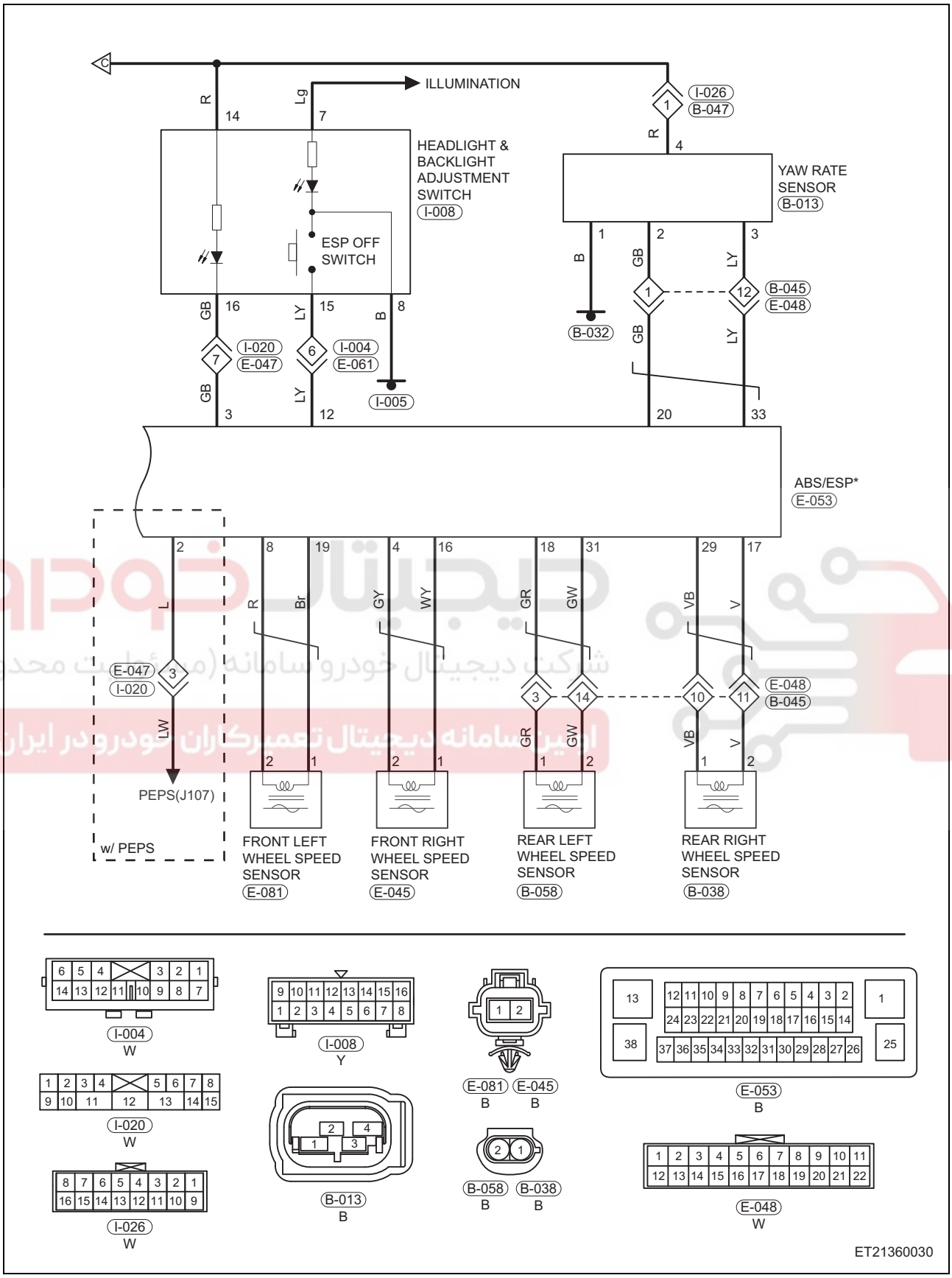
Brake Control System (Page 3 of 3)



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DIAGNOSIS & TESTING

Problem Symptoms Table

HINT:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair or adjust faulty components, or replace as necessary.

Symptom	Suspected Area	See page
When turning ignition switch ON, ABS/ESP warning light does not come on	Fuse	68-59
	Wire harness or connector	-
	ABS/ESP control module assembly	36-86
	Instrument cluster	51-48
ABS/ESP warning light remains on	Fuse	68-59
	Wire harness or connector	-
	ABS/ESP control module assembly	36-86
	Instrument cluster	51-48
ABS/ESP operation is abnormal	Wheel speed sensor (damaged, improperly installed, foreign matter attached)	36-89, 36-91
	Hub ring gear (damaged, improperly installed, foreign matter attached)	-
	Brake line (blocked or leaked)	-
	Wire harness or connector	-
	ABS/ESP control module assembly	36-86
Communication with diagnostic tester cannot be performed	Fuse	68-59
	Wire harness or connector	-
	X-431 3G diagnostic tester	-
	ABS/ESP control module assembly	36-86

Diagnosis Procedure

HINT:
Use following procedures to troubleshoot the brake control system.

1	**Vehicle brought to workshop**

NEXT

2	**Check battery voltage**

Standard voltage: 11 to 14 V

If voltage is below 11 V, recharge or replace the battery before proceeding to next step.

NEXT

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3	Customer problem analysis

NEXT

4	Check and clear DTCs

NEXT

5	Confirm and duplicate malfunction: accelerate vehicle to 15 km/h or above, simulate malfunction conditions and read DTCs again

DTC occurs → For current DTC, go to step 7

No DTC → For history DTC, go to step 8

6	Problem repair (no DTC), then go to step 9

NEXT

7	Troubleshoot according to Diagnostic Trouble Code (DTC) Chart, then go to step 9

NEXT

8	Troubleshoot according to Problem Symptoms Table, then go to step 9

NEXT

9	Conduct test and confirm malfunction has been repaired

NEXT

10	End

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Problem Repair (No DTC)

If there is a problem in brake system, but no DTC is stored in ABS/ESP control module assembly, this problem is called a problem without DTC. A problem without DTC is caused by basic brake system malfunction. For example:

1. Brake fluid leakage (it may result in weak braking, brake pedal overtravel or even ineffective braking).
2. Use of inferior brake fluid (it can result in corrosion of brake line and ABS hydraulic regulating module internal elements, or even ineffective braking).
3. Air in brake line (it may result in weak braking or even ineffective braking).
4. Brake line blockage (it may result in hard braking or even ineffective braking).
5. Excessive wear of brake disc (it may result in weak braking or brake pedal overtravel).
6. Brake booster malfunction (it may result in weak or hard braking, brake pedal overtravel or even ineffective braking).
7. Wrong brake line connection (it may result in ABS/ESP braking performance decrease, drift, long braking distance etc.).

HINT:

- ABS/ESP no power supply or power supply abnormality will cause ABS/ESP warning light always on without storing DTC.
- Troubleshooting method: check components corresponding to the problem symptom, repair or replace as necessary.

DTC Confirmation Procedure

Confirm that battery voltage is normal before performing following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Using X-431 3G diagnostic tester, record and clear DTCs stored in ABS/ESP control module assembly.
- Turn ignition switch to LOCK and wait for a few seconds.
- Start engine, drive vehicle at 20 km/h or more and perform a road test with X-431 3G diagnostic tester connected to Data Link Connector (DLC).
- Use X-431 3G diagnostic tester to read DTCs.
- If DTC is detected, malfunction indicated by DTC is current. Go to diagnosis procedure - Step 1.
- If DTC is not detected, malfunction indicated by DTC is intermittent. Please refer to Intermittent DTC Troubleshooting.

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Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connectors are loose.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Wiggle related wire harnesses and connectors and observe if signal is interrupted in the related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for the changed data or the reset DTCs during wiggle test.
- Check for broken, bent, protruded or corroded terminals.
- Check wheel speed sensors and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground points related to the current DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to the DTC.
- Refer to any Technical Bulletin that may apply to the malfunction.

Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This may change the way in which a circuit works.

Circuits are very sensitive to ground that is normal or not. Loose or corroded ground can affect the control circuit. Check the ground points as follows:

1. Remove ground bolt or nut.
2. Check all contact surfaces for tarnish, dirt and rust, etc.
3. Clean as necessary to ensure that contacting is in good condition.
4. Reinstall ground bolt or nut securely.
5. Check if add-on accessories interfere with ground circuit.
6. If several wire harnesses are crimped into one ground terminal, check if they are installed correctly. Make sure all wire harnesses are clean and securely fastened while providing a good route to ground.

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ABS/ESP Control Module Assembly Terminal List

Pin No.	Function	Pin No.	Function
1	Power Supply Terminal (Positive) of Motor	20	Yaw Rate Sensor
2	Wheel Speed Sensor Output Terminal (Only for PEPS Model)	21	Undefined
3	ESP OFF Switch Indicator	22	Undefined
4	Wheel Speed Sensor Signal Terminal (Front Right)	23	Undefined
5	Undefined	24	Undefined
6	Undefined	25	Power Supply Terminal of Valve Relay
7	Undefined	26	CAN1 H (CAN High)
8	Wheel Speed Sensor Signal Terminal (Front Left)	27	Undefined
9	Undefined	28	Power Supply Terminal of ECU (Ignition Power Cable)
10	Undefined	29	Wheel Speed Sensor Signal Terminal (Rear Right)
11	Undefined	30	Brake Light Switch
12	ESP OFF Switch	31	Power Supply Terminal of Wheel Speed Sensor (Rear Left)
13	Ground Terminal of Motor	32	Undefined
14	CAN1 L (CAN Low)	33	Yaw Rate Sensor
15	Undefined	34	Undefined
16	Power Supply Terminal of Wheel Speed Sensor (Front Right)	35	Undefined
17	Power Supply Terminal of Wheel Speed Sensor (Rear Right)	36	Undefined
18	Wheel Speed Sensor Signal Terminal (Rear Left)	37	Undefined
19	Power Supply Terminal of Wheel Speed Sensor (Front Left)	38	ECU Ground Terminal

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Calibration

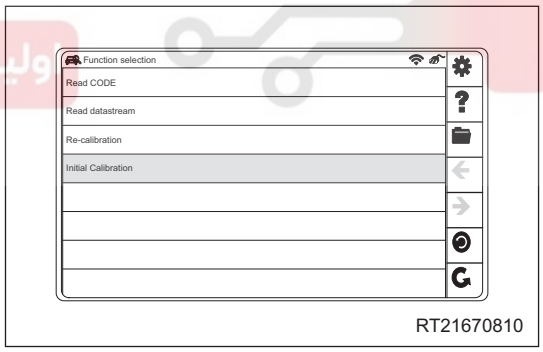
Calibration of Steering Angle Sensor

1. Preconditions for Sensor Calibration
   a. Perform zero calibration after steering sensor is installed.
   b. Calibration should be finished on front wheels (four-wheel) alignment station (confirm that four-wheel alignment parameters are correct).
   c. Before calibration, make the vehicle face ahead. Wheels must be in line along driving direction, error of both angles should be met toe-in value in four-wheel alignment parameters (for details of data, refer to related content in Repair Manual), and steering wheel must be centered.
   d. Before performing calibration again for calibrated sensor, perform recalibration for sensor, that is, make the sensor back to calibration status.

CAUTION

- The most important is that pay special attention to center of steering wheel during actual calibration. If not centered, it may cause error calibration data even the data is correct when performing four-wheel alignment. It may cause error due to long-term accumulation during driving, or it may cause outrange when turning steering wheel fully, thus ESP light will come on. So steering wheel must be centered during four-wheel alignment.

2. Operation Procedures:
   a. Connect the diagnostic tester.
   b. Turn ignition switch ON.
   c. Confirm that steering wheel in centered (vehicle faces ahead, and wheels must be in line along driving direction. Adjust steering wheel with centered).
   d. Enter "SAM (Steering Angle Module)" menu, and click "Initial Calibration".



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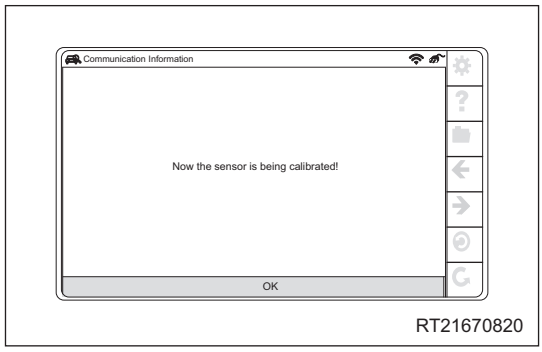
- If sensor is fault, exit Calibration.
- If sensor has not been calibrated, perform calibration automatically.



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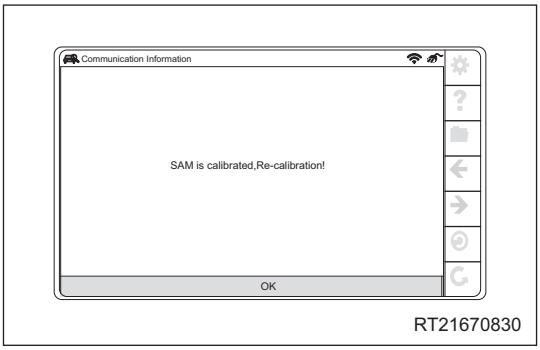
- If sensor has been calibrated, it reminds that "Re-calibration" is needed. Click "Recalibration" according to display on diagnostic tester, then click "Initial Calibration" again. If there is no response, exit Calibration.



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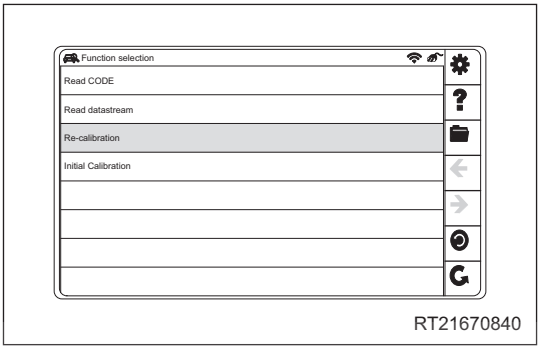

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e. There is a reminder whether calibration is successful or not on diagnostic tester.

⚠ WARNING

- Never cut off the power during calibration.

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CAUTION

- Calibration the steering angle sensor again when performing four-wheel alignment for vehicle.

Calibration of Yaw Rate Sensor

1. Initial conditions before sensor calibration:
   a. Maximum tilt angle of vehicle must be within permissible range, that is both alignment directions must be satisfied with ±0.57° (±1%).
   b. Tester must be stationary.
   c. Turn steering wheel to straight ahead position.
   d. Tire pressure is correct.
   e. Normal load condition.
   f. Low vehicle fuel tank volume is permitted.
   g. Vehicle is supported by its wheels.
   h. Only driver sits in vehicle.
   i. No other vibrating interferences such as closing the door or engine cover.
   j. Calibration can be performed on rotary hub tester or a flat area.

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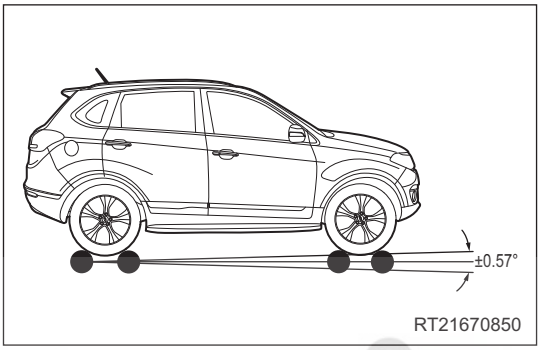
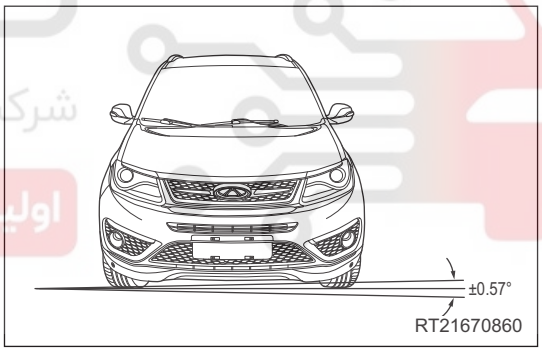
CAUTION

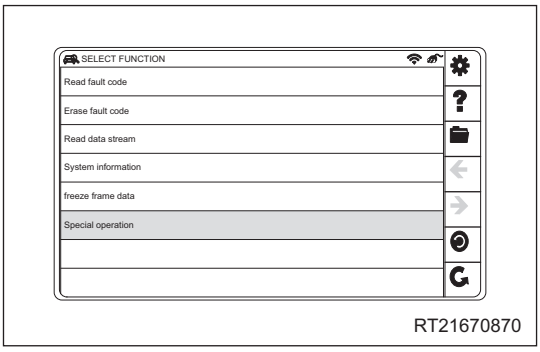
- EEPROM of ESP in delivery state has already equipped with predefined offset amount. ECU will write the newly measured data into EEPROM and it will be used by ESP. ESP cannot confirm some preconditions mentioned above, so the customer must make sure that calibration conditions above are established. If offset amount is too large, system will refuse to perform calibration, at this time, it is necessary to bring the vehicle to factory. When replacing ESP, be sure to perform IIS calibration.

2. Operation steps:
   a. Connect the diagnostic tester.
   b. Turn ignition switch ON.
   c. Make sure that maximum inclination angle of vehicle must be within permissible range, that is both alignment directions must be satisfied with ±0.57° (±1%).





   d. Enter "ESP" system menu, click "Special Operation".



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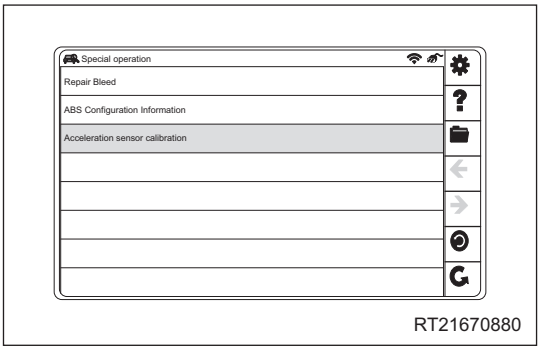
e. Click "Acceleration Sensor Calibration"



⚠ WARNING

- Never cut off the power during calibration.

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Diagnostic Trouble Code (DTC) Chart

Trouble Type Byte (Hex)	Description
00	No Data Information
01	Normal Circuit Failure
04	System Internal Failure
08	Bus Signal/Message Error
09	Component Failure
11	Circuit Short To Ground
12	Circuit Short To Power Supply
13	Circuit Open
16	Circuit Voltage Below Threshold
17	Circuit Voltage Above Threshold
28	Signal Deviation Out Of Range
29	Signal Invalid
31	No Signal
38	Signal Frequency Error
49	Internal Circuit Failure
52	Inactivated
53	Function Off
54	Missing Calibration
55	Not Configured
64	Signal Reliability Failure

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Diagnostic Trouble Code (DTC) Chart

DTC	Description
C0001 04	TCS Control Channel Changeover Valve1 (ESP Only)
C0002 04	TCS Control Channel Changeover Valve2 (ESP Only)
C0003 04	TCS Control Channel High Pressure Switch Valve1 (ESP Only)
C0004 04	TCS Control Channel High Pressure Switch Valve2 (ESP Only)
C0010 04	Left Front Inlet Control
C0011 04	Left Front Outlet Control
C0014 04	Right Front Inlet Control
C0015 04	Right Front Outlet Control
C0018 04	Left Rear Inlet Control
C0019 04	Left Rear Outlet Control
C001C 04	Right Rear Inlet Control
C001D 04	Right Rear Outlet Control

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DTC	Description
C0020 04	ABS Pump Motor Control
C0031 00	Left Front Wheel Speed Sensor
C0031 09	Left Front Wheel Speed Sensor
C0031 11	Left Front Wheel Speed Sensor
C0031 12	Left Front Wheel Speed Sensor
C0031 13	Left Front Wheel Speed Sensor
C0031 29	Left Front Wheel Speed Sensor
C0034 00	Right Front Wheel Speed Sensor
C0034 09	Right Front Wheel Speed Sensor
C0034 11	Right Front Wheel Speed Sensor
C0034 12	Right Front Wheel Speed Sensor
C0034 13	Right Front Wheel Speed Sensor
C0034 29	Right Front Wheel Speed Sensor
C0037 00	Left Rear Wheel Speed Sensor
C0037 09	Left Rear Wheel Speed Sensor
C0037 11	Left Rear Wheel Speed Sensor
C0037 12	Left Rear Wheel Speed Sensor
C0037 13	Left Rear Wheel Speed Sensor
C0037 29	Left Rear Wheel Speed Sensor
C003A 00	Right Rear Wheel Speed Sensor
C003A 09	Right Rear Wheel Speed Sensor
C003A 11	Right Rear Wheel Speed Sensor
C003A 12	Right Rear Wheel Speed Sensor
C003A 13	Right Rear Wheel Speed Sensor
C003A 29	Right Rear Wheel Speed Sensor
C0040 29	Brake Pedal Switch
C0040 64	Brake Pedal Switch
C0044 01	Brake Pressure Sensor
C0044 28	Brake Pressure Sensor
C0051 29	Steering Wheel Position Sensor (ESP Only)
C0051 54	Steering Wheel Position Sensor (ESP Only)
C0051 64	Steering Wheel Position Sensor (ESP Only)
C0061 29	Lateral Acceleration Sensor (ESP Only)
C0061 64	Lateral Acceleration Sensor (ESP Only)
C0062 49	Longitudinal Acceleration Sensor (ESP Only)
C0062 29	Longitudinal Acceleration Sensor (ESP Only)
C0062 54	Longitudinal Acceleration Sensor (ESP Only)

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DTC	Description
C0062 64	Longitudinal Acceleration Sensor (ESP Only)
C0063 08	Yaw Rate Sensor (ESP Only)
C0063 29	Yaw Rate Sensor (ESP Only)
C0063 31	Yaw Rate Sensor (ESP Only)
C0063 49	Yaw Rate Sensor (ESP Only)
C0063 54	Yaw Rate Sensor (ESP Only)
C0063 64	Yaw Rate Sensor (ESP Only)
C006B 00	Stability System Active Too Long (ESP Only)
C0089 04	TCS Disable Switch (ESP Only)
C1000 16	ECU Voltage Supply
C1000 17	ECU Voltage Supply
C1001 04	ECU
C1002 49	CAN Hardware
C1003 04	Valve Relay
C1004 00	General Valve
C1005 08	Hand Brake Switch
C1006 29	Clutch Switch
C1007 29	Reverse Gear Switch
C1008 00	General WSS
C1009 00	ECU Hardware Related
U0005 00	High Speed CAN Communication Bus (+) High
U0007 00	High Speed CAN Communication Bus (-) Low
U0073 00	Control Module Communication Bus Off
U0100 00	Lost Communication With ECM
U0101 00	Lost Communication With TCM (ESP Only)
U0126 00	Lost Communication With Steering Angle Sensor Module (ESP Only)
U0140 00	Lost Communication With BCM
U0401 00	Invalid Data Received From ECM
U0402 00	Invalid Data Received From TCM (ESP Only)
U0428 00	Invalid Data Received From Steering Angle Sensor Module (ESP Only)
U0422 00	Invalid Data Received From Body Control Module
U1000 00	CAN Error Passive
U1300 55	Software Configuration Error
U0414 00	Invalid Data Received From TMM (ESP Only)
U0292 00	Lost Communication With TMM (ESP Only)
U0073 00	Control Module Communication Bus Off

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DTC	C0001 04	TCS Control Channel Changeover Valve1 (ESP Only)
DTC	C0002 04	TCS Control Channel Changeover Valve2 (ESP Only)
DTC	C0003 04	TCS Control Channel High Pressure Switch Valve1 (ESP Only)
DTC	C0004 04	TCS Control Channel High Pressure Switch Valve2 (ESP Only)
DTC	C0010 04	Left Front Inlet Control
DTC	C0011 04	Left Front Outlet Control
DTC	C0014 04	Right Front Inlet Control
DTC	C0015 04	Right Front Outlet Control
DTC	C0018 04	Left Rear Inlet Control
DTC	C0019 04	Left Rear Outlet Control
DTC	C001C 04	Right Rear Inlet Control
DTC	C001D 04	Right Rear Outlet Control

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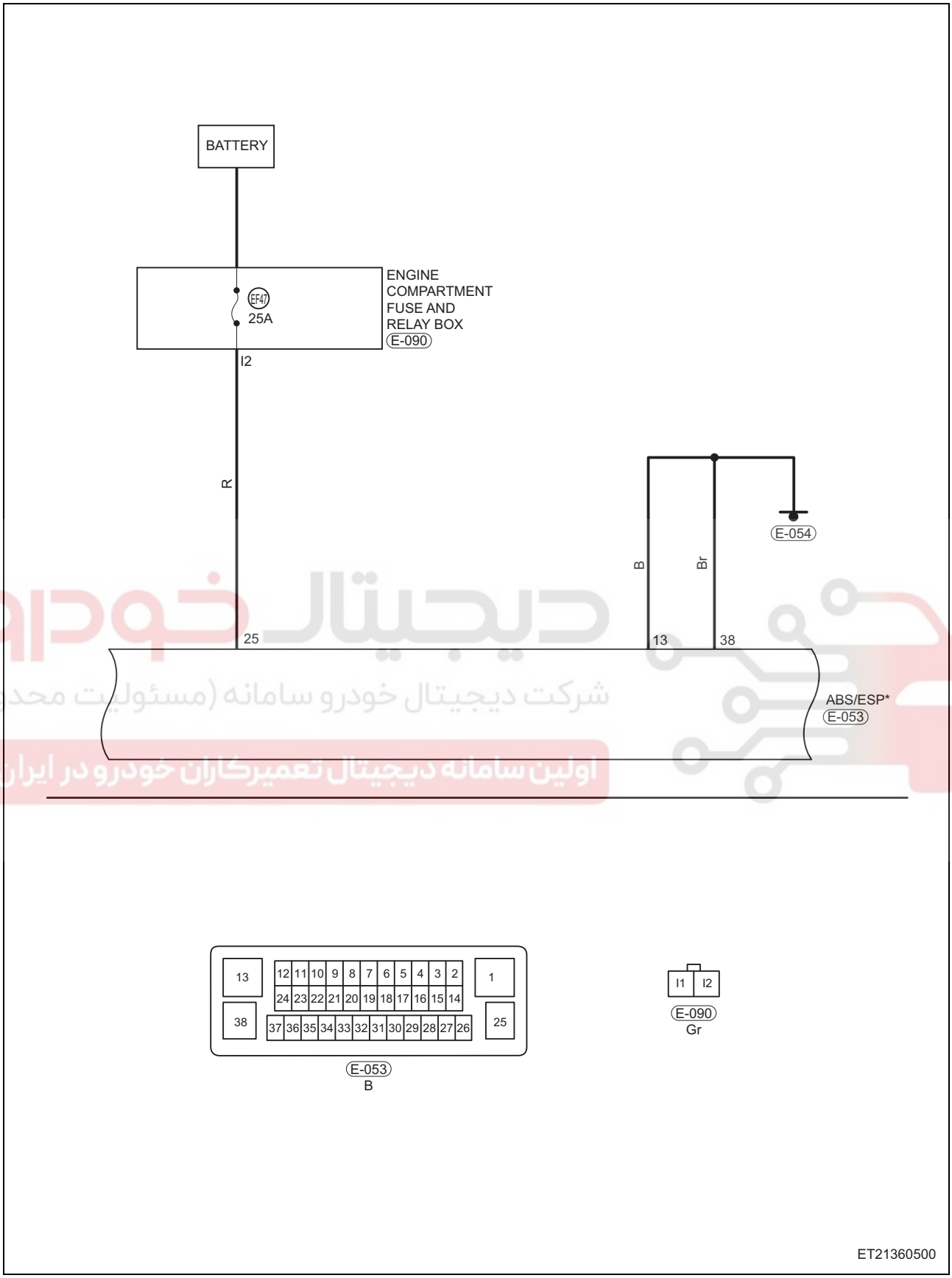

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0001 04	TCS Control Channel Changeover Valve1 (ESP Only)	These DTC occur when any of following conditions is met: 1. Valve power supply malfunction (short to ground in power supply or ground circuit open). 2. Solenoid valve temperature too high (overheat protection). 3. Short circuit in more than 5 solenoid valves (fuses). 4. Corresponsive solenoid valve activated with no feedback. 5. Solenoid valve itself malfunction. 6. Valve set relay malfunction.	• Abnormal valve relay power supply • Poor connection of ABS/ESP control module assembly and ground • Fuse malfunction • Short to power supply or ground in solenoid valve, or open circuit • System overheat protection • ABS/ESP control module assembly damaged
C0002 04	TCS Control Channel Changeover Valve 2 (ESP Only)		
C0003 04	TCS Control Channel High Pressure Switch Valve1 (ESP Only)		
C0004 04	TCS Control Channel High Pressure Switch Valve2 (ESP Only)		
C0010 04	Left Front Inlet Control		
C0011 04	Left Front Outlet Control		
C0014 04	Right Front Inlet Control		
C0015 04	Right Front Outlet Control		
C0018 04	Left Rear Inlet Control		
C0019 04	Left Rear Outlet Control		
C001C 04	Right Rear Inlet Control		
C001D 04	Right Rear Outlet Control		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check for DTCs

a. Leave vehicle for 5 minutes, clear and read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.

b. Refer to DTC Confirmation Procedure.

c. Check if same DTC is output.

NO → **Problem indicated by DTC is intermittent (system overheat protection)**

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YES

2	Check fuse

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Remove fuse EF-47 (25 A) from engine compartment fuse and relay box.
d. Check if fuse is blown.

NG → **Replace fuse EF-06**

OK

3	Check wire harness and connector

Use circuit diagram as a guide to perform the following procedures:

- Turn ignition switch to LOCK.
- Disconnect the negative battery cable.
- Disconnect ABS/ESP control module assembly connector E-053 and engine compartment fuse and relay box connector E-090.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if terminal contact pins of related connectors are in good condition.

NG → **Repair or replace body wire harness and connector**

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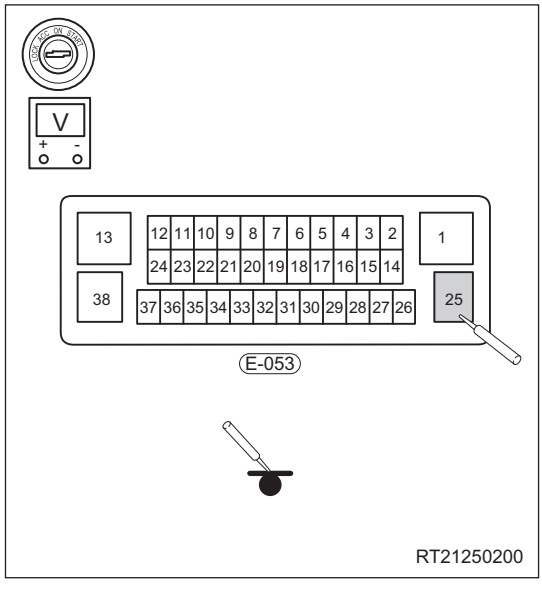
OK

4	Check ABS/ESP control module power supply circuit (ABS/ESP control module assembly - battery)

a. Connect the negative battery cable.
b. Turn ignition switch to LOCK.
c. Disconnect the ABS/ESP control module assembly connector E-053.
d. Using a digital multimeter, measure voltage between terminal 25 of ABS/ESP control module assembly and body ground to check if system power supply circuit is normal according to table below.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
E-053 (25) - Body ground	Always	9 to 16 V



NG → **Repair or replace body wire harness and connector**

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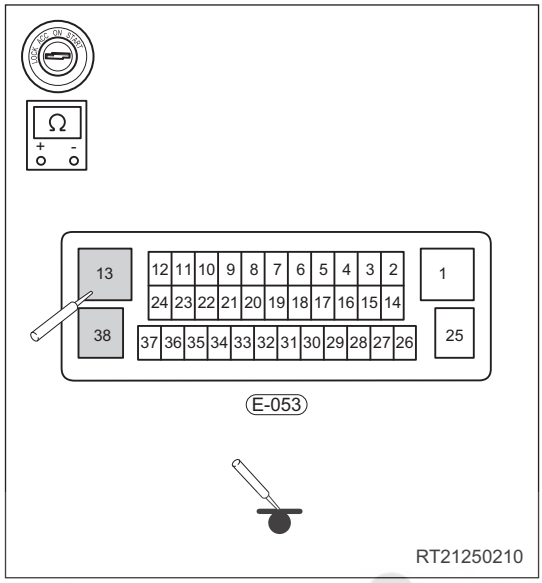
5	Check ABS/ESP control module ground circuit (ABS/ESP control module assembly - body ground)

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS/ESP control module assembly connector E-053.
d. Using a digital multimeter, check for continuity between ABS/ESP control module assembly terminals 13, 38 and body ground to check if system ground circuit is normal according to table below.

   Using a digital multimeter, check for continuity between terminals 13, 38 of ABS/ESP control module assembly and body ground to check if system ground circuit is normal according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-051 (13) - Body ground	Always	Continuity
E-051 (38) - Body ground	Always	Continuity



NG → **Repair or replace body wire harness and connector**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.
b. Start the engine.
c. Drive vehicle at 15 km/h or above, read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if same DTC is output.

NO → **System operates normally**

YES

Replace ABS/ESP control module assembly

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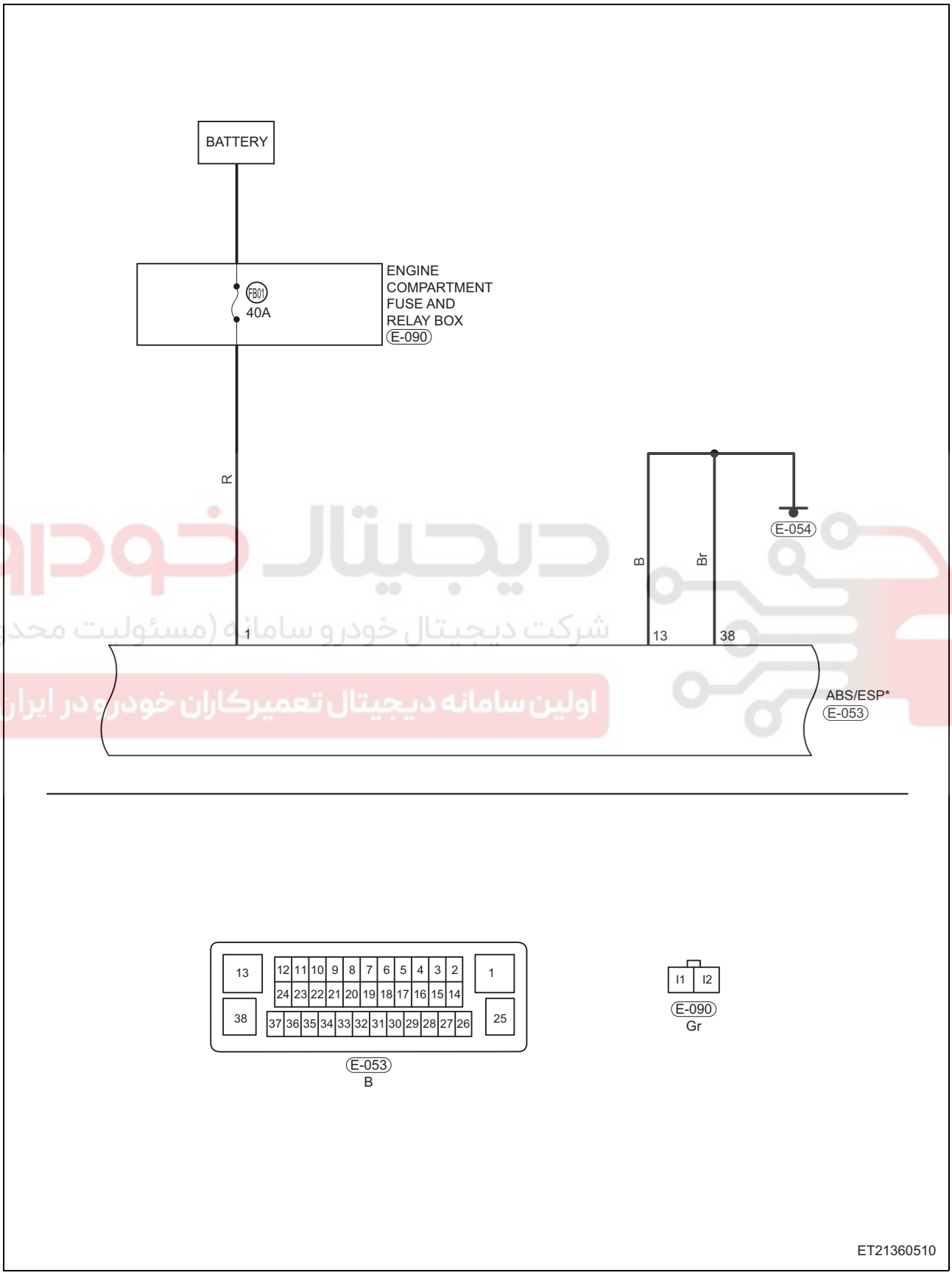
DTC	C0020 04	ABS Pump Motor Control	System Internal Failures



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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0020 04	ABS Pump Motor Control	This DTC occurs when any of following conditions is met: 1. Pump motor operates with overload, and temperature is too high (over protection). 2. Return pump monitor still cannot detect voltage signal after return pump motor relay operates for 60 ms. 3. Return pump monitor detects voltage for more than 2.5 s when return pump motor relay does not operate. 4. Return pump monitor detects that voltage does not drop when return pump motor relay stop operating.	• Fuse malfunction • Pump motor has poor ground connection • System overheating protection • Abnormal pump motor power supply • Pump motor relay malfunction • Pump motor malfunction

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CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check for DTCs

a. Leave vehicle for 5 minutes, clear and read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.

b. Refer to DTC Confirmation Procedure.

c. Check if same DTC is output.

NO → **Problem indicated by DTC is intermittent (system overheat protection)**

YES

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2	Check fuse

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Remove fuse FB-01 (40 A) from engine compartment fuse and relay box.
d. Check if fuse is blown.

NG → **Replace fuse FB-01**

OK

3	Check wire harness and connector

Use circuit diagram as a guide to perform the following procedures:

- Turn ignition switch to LOCK.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector E-053.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if terminal contact pins of related connectors are in good condition.

NG → **Repair or replace body wire harness and connector**

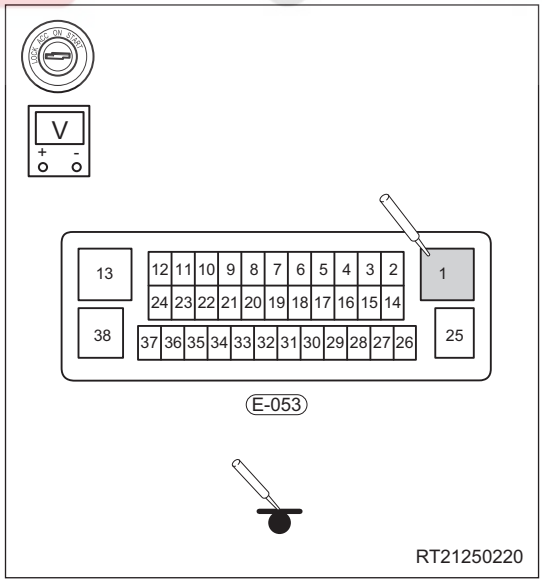
OK

4	Check wire harness and connector (ABS/ESP control module assembly - battery)

a. Connect the negative battery cable.
b. Turn ignition switch to LOCK.
c. Disconnect the ABS/ESP control module assembly connector E-053.
d. Using a digital multimeter, measure voltage between terminal 1 of ABS/ESP control module assembly and body ground to check if system power supply circuit is normal according to table below.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
E-053 (1) - Body ground	Always	9 to 16 V



NG → **Repair or replace body wire harness and connector**

OK

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5	Check wire harness and connector (ABS/ESP control module assembly - body ground)

a. Turn ignition switch to LOCK.

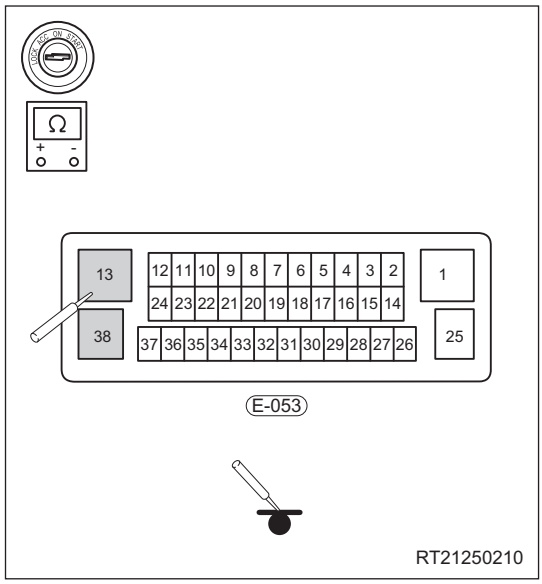
b. Disconnect the negative battery cable.

c. Disconnect the ABS/ESP control module assembly connector E-053.

d. Using a digital multimeter, check for continuity between ABS/ESP control module assembly terminals 13, 38 and body ground to check if system ground circuit is normal according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (13) - Body ground	Always	Continuity
E-053 (38) - Body ground	Always	Continuity



NG → **Repair or replace body wire harness and connector**

OK ↓

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.

b. Start the engine.

c. Drive vehicle at 15 km/h or above, read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.

d. Check if same DTC is output.

NO → **System operates normally**

YES ↓

Replace ABS/ESP control module assembly

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DTC	C0031 00	Left Front Wheel Speed Sensor	No Subtype Information
DTC	C0031 09	Left Front Wheel Speed Sensor	Component Failures
DTC	C0031 11	Left Front Wheel Speed Sensor	Circuit Short To Ground
DTC	C0031 12	Left Front Wheel Speed Sensor	Circuit Short To Battery
DTC	C0031 13	Left Front Wheel Speed Sensor	Circuit Open
DTC	C0031 29	Left Front Wheel Speed Sensor	Signal Invalid

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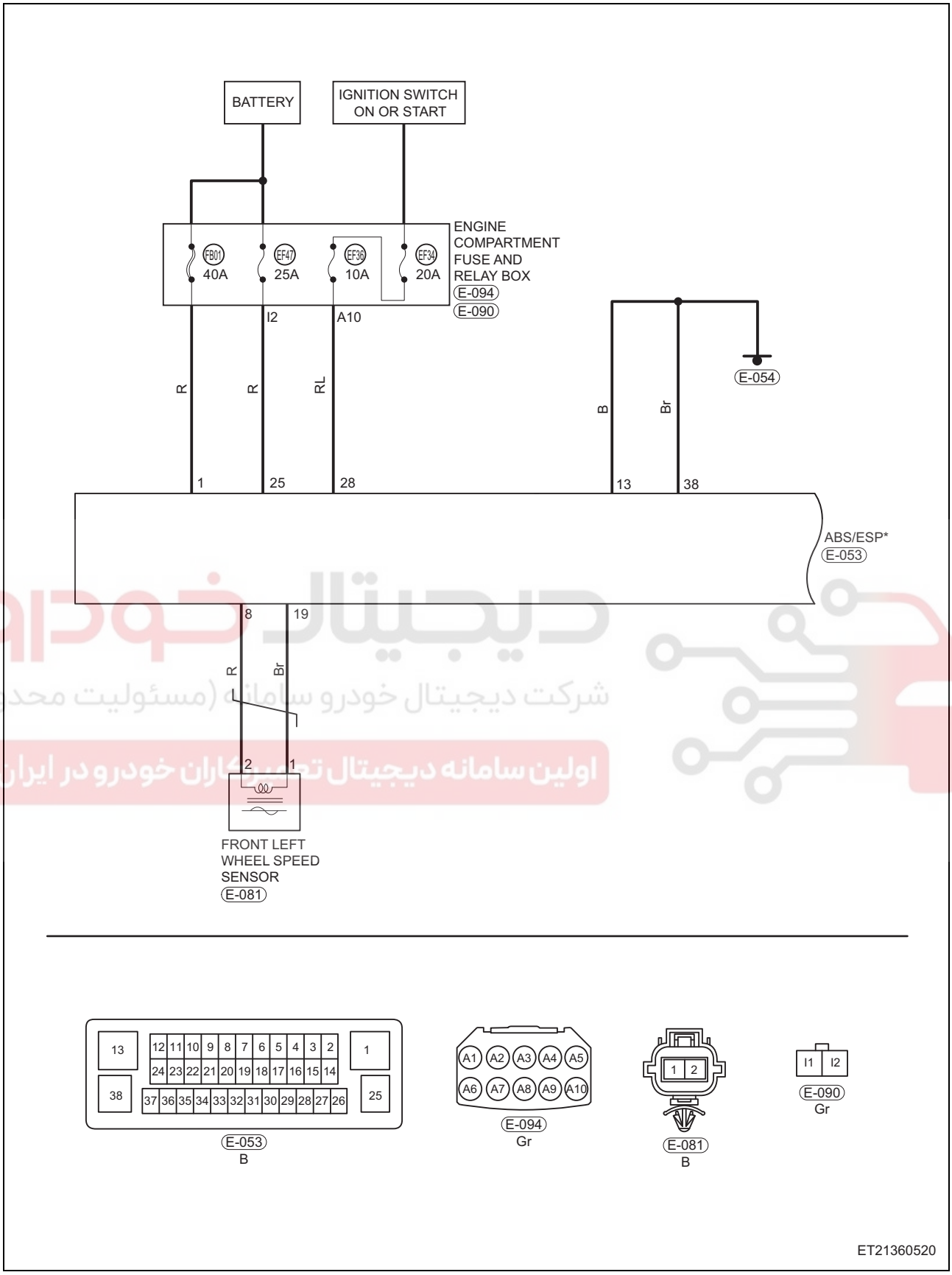

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0031 00	Left Front Wheel Speed Sensor	This DTC occurs when any of following conditions is met: 1. ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to ground. 2. Wheel speed sensor line is open. 3. ABS/ESP control module assembly detects that wheel speed sensor signal wire is short To Battery. 4. ABS/ESP control module assembly detects that wheel speed sensor power supply wire is short to ground. 5. Wheel speed sensor signal is invalid.	• Reverse connection of wheel speed sensor signal wire and power supply wire • Short to ground in wheel speed sensor signal wire • Wheel speed sensor wire is disconnected, or connector is loose or broken • Short To Battery in wheel speed sensor signal wire • Short to ground in wheel speed sensor power supply wire • Sensor head or connector pin damaged • Wheel speed sensor is interfered by outside magnetic field (wheel or axle not demagnetized) • Wheel speed sensor body malfunction • Ring gear is not installed, missing teeth, dirty, demagnetized, or off-centered • Excessive clearance between sensor and ring gear • Wrong number of ring gear teeth • Tire size is not as specified • ABS/ESP control module assembly is damaged
C0031 09	Left Front Wheel Speed Sensor		
C0031 11	Left Front Wheel Speed Sensor		
C0031 12	Left Front Wheel Speed Sensor		
C0031 13	Left Front Wheel Speed Sensor		
C0031 29	Left Front Wheel Speed Sensor		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check front left wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the front left wheel speed sensor connector E-081.
d. Check if wire harnesses are worn, pierced, pinched or partially broken.
e. Check for broken, bent, protruded or corroded terminals.
f. Check if related connector terminal contact pins are in good condition.

NG → **Repair of replace front left wheel speed sensor wire harness and connector**

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OK

2	Check installation of front left wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check front left wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between installation position of front left wheel speed sensor and front steering knuckle.
e. Check installation position of front left wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace front left wheel speed sensor**

OK

3	Check front left wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive vehicle straight ahead, and read datastream of front left wheel speed sensor with X-431 3G diagnostic tester.
c. Check if data change of front left wheel speed sensor matches that of other wheel speed sensors.

NG → **Replace left front wheel speed sensor**

OK

4	Check front left hub ring gear

a. Remove the front left hub assembly.
b. Check for foreign matter, missing teeth or damage on front left hub ring gear.
c. Check if front left hub assembly is securely installed.

NG → **Replace front left hub ring gear**

OK

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5	Check wire harness and connector (front left wheel speed sensor - ABS/ESP control module assembly)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

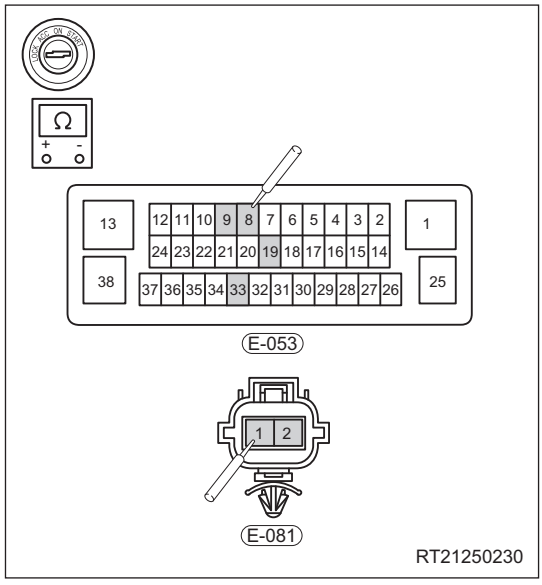
c. Disconnect the ABS/ESP control module assembly connector E-053.

d. Disconnect the front left wheel speed sensor connector E-081.

e. Using a digital multimeter, check for continuity between terminals of connector E-053 and connector E-081 to check if there is an open in wire harness and connector according to table below.

Standard Condition

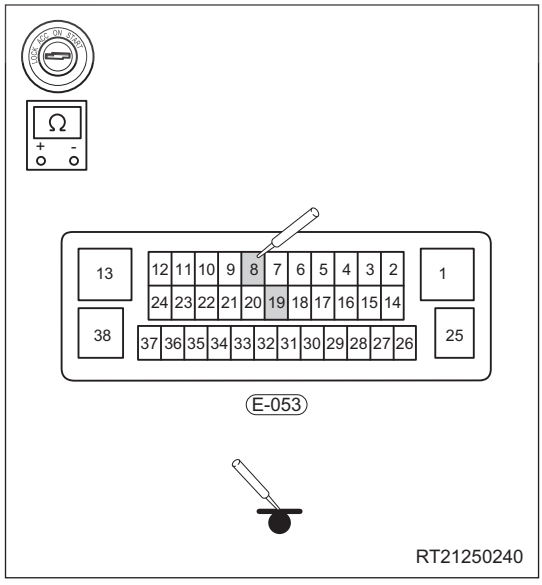
Multimeter Connection	Condition	Specified Condition
E-053 (8) - E-081 (2)	Always	Continuity
E-053 (19) - E-081 (1)	Always	Continuity
E-053 (8) - E-081 (1)	Always	No continuity
E-053 (19) - E-081 (2)	Always	No continuity
E-081 (1) - E-081 (2)	Always	No continuity
E-053 (8) - E-053 (19)	Always	No continuity



f. Using a digital multimeter, check for continuity between connector E-053 and body ground to check if front left wheel speed sensor is short to ground according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (8) - Body ground	Always	No continuity
E-053 (19) - Body ground	Always	No continuity



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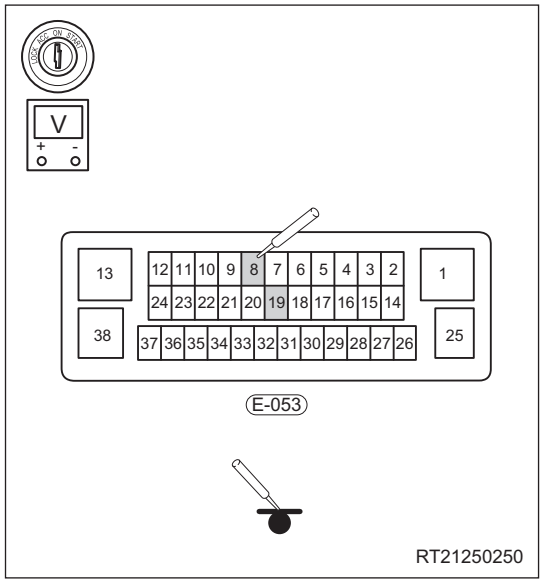
g. Connect the negative battery cable.

h. Turn ignition switch to ON.

i. Using a digital multimeter, measure voltage between connector E-053 and body ground to check if front left wheel speed sensor is short To Battery according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (8) - Body ground	Ignition switch ON	Approx. 0 V
E-053 (19) - Body ground	Ignition switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between front left wheel speed sensor and ABS/ESP control module assembly**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.

b. Start the engine.

c. Drive vehicle at 15 km/h or above, read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.

d. Check if same DTC is output.

NO → **System operates normally**

YES

Replace ABS/ESP control module assembly

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DTC	C0034 00	Right Front Wheel Speed Sensor	No Subtype Information
DTC	C0034 09	Right Front Wheel Speed Sensor	Component Failures
DTC	C0034 11	Right Front Wheel Speed Sensor	Circuit Short To Ground
DTC	C0034 12	Right Front Wheel Speed Sensor	Circuit Short To Battery
DTC	C0034 13	Right Front Wheel Speed Sensor	Circuit Open
DTC	C0034 29	Right Front Wheel Speed Sensor	Signal Invalid

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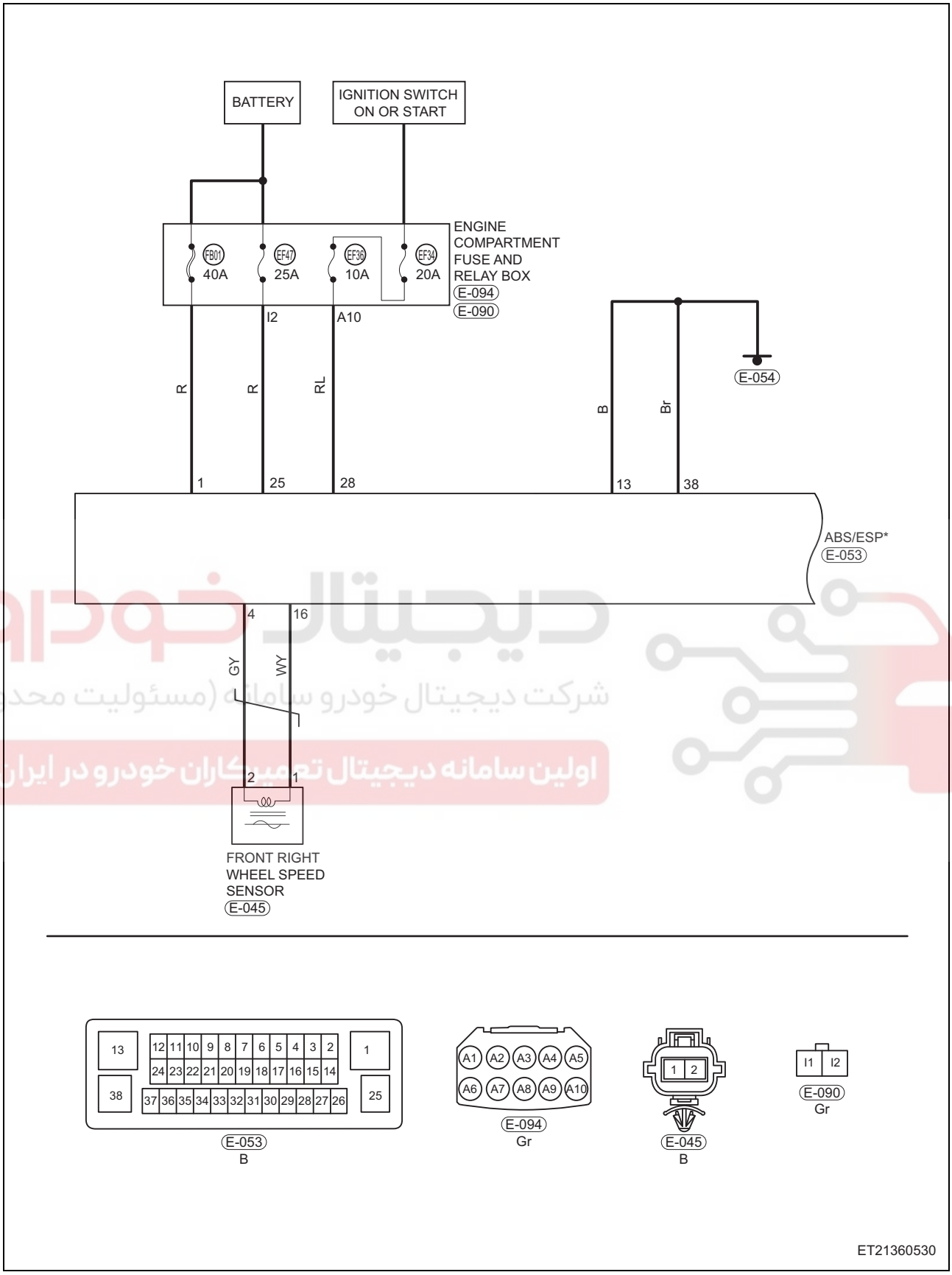

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0034 00	Right Front Wheel Speed Sensor	These DTC occur when any of following conditions is met: 1. ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to ground. 2. Wheel speed sensor wire is open. 3. ABS/ESP control module assembly detects that wheel speed sensor signal wire is short To Battery. 4. ABS/ESP control module assembly detects that wheel speed sensor power supply wire is short to ground. 5. Wheel speed sensor signal is invalid.	• Reverse connection of wheel speed sensor signal wire and power supply wire • Short to ground in wheel speed sensor signal wire • Wheel speed sensor wire is disconnected, or connector loose or broken • Short To Battery in wheel speed sensor signal wire • Short to ground in wheel speed sensor power supply wire • Sensor head or connector pin is damaged • Wheel speed sensor is interfered by outside magnetic field (wheel or axle not demagnetized) • Wheel speed sensor body malfunction • Ring gear is not installed, missing teeth, dirty, demagnetized, or off centered • Excessive clearance between sensor and ring gear • Wrong number of ring gear teeth • Tire size is not as specified • ABS/ESP control module assembly is damaged
C0034 09	Right Front Wheel Speed Sensor		
C0034 11	Right Front Wheel Speed Sensor		
C0034 12	Right Front Wheel Speed Sensor		
C0034 13	Right Front Wheel Speed Sensor		
C0034 29	Right Front Wheel Speed Sensor		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check front right wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the front right wheel speed sensor connector E-045.
d. Check if wire harnesses are worn, pierced, pinched or partially broken.
e. Check for broken, bent, protruded or corroded terminals.
f. Check if related connector terminal contact pins are in good condition.

NG → **Repair of replace front right wheel speed sensor wire harness and connector**

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OK

2	Check installation of front right wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check front right wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between installation position of front right wheel speed sensor and front steering knuckle.
e. Check installation position of front right wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace front right wheel speed sensor**

OK

3	Check front right wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive vehicle straight ahead, and read datastream of front right wheel speed sensor with X-431 3G diagnostic tester.
c. Check if data change of front right wheel speed sensor matches that of other wheel speed sensors.

NG → **Replace front right wheel speed sensor**

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OK

4	Check front right hub ring gear

a. Remove the front right hub assembly.
b. Check for foreign matter, missing teeth or damage on front right hub ring gear.
c. Check if front right hub assembly is securely installed.

NG → **Replace front right hub ring gear**

OK

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5	Check wire harness and connector (front right wheel speed sensor - ABS/ESP control module assembly)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

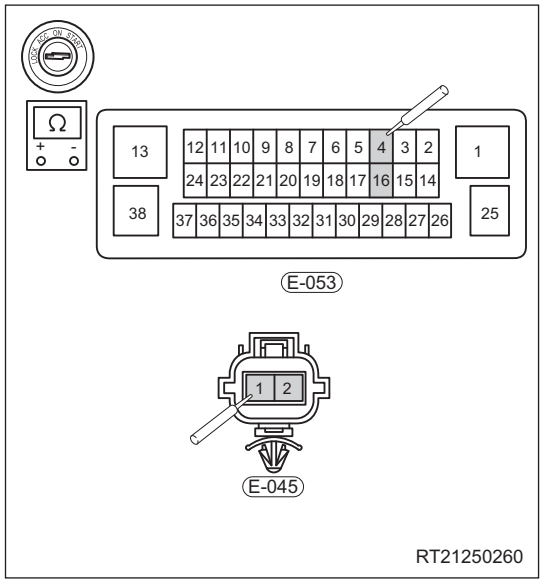
c. Disconnect the ABS/ESP control module assembly connector E-053.

d. Disconnect the front right wheel speed sensor connector E-045.

e. Using a digital multimeter, check for continuity between terminals of connector E-053 and connector E-045 to check if there is an open in wire harness and connector according to table below.

Standard Condition

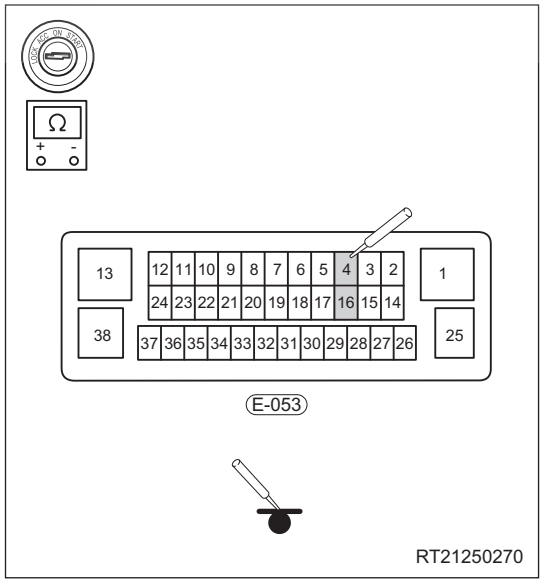
Multimeter Connection	Condition	Specified Condition
E-053 (4) - E-045 (2)	Always	Continuity
E-053 (16) - E-045 (1)	Always	Continuity
E-053 (4) - E-045 (1)	Always	No continuity
E-053 (16) - E-045 (2)	Always	No continuity
E-045 (1) - E-045 (2)	Always	No continuity
E-053 (4) - E-053 (16)	Always	No continuity



f. Using a digital multimeter, check for continuity between connector E-053 and body ground to check if front right wheel speed sensor is short to ground according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (4) - Body ground	Always	No continuity
E-053 (16) - Body ground	Always	No continuity



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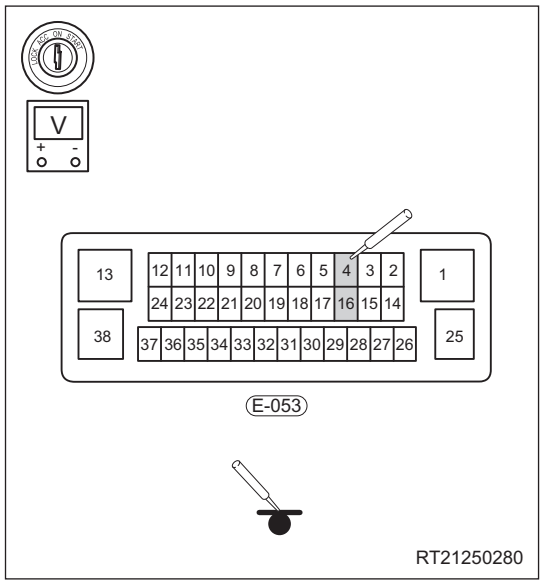
g. Connect the negative battery cable.

h. Turn ignition switch to ON.

i. Using a digital multimeter, measure voltage between connector E-053 and body ground to check if front right wheel speed sensor is short To Battery according to table below.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
E-053 (4) - Body ground	Ignition switch ON	Approx. 0 V
E-053 (16) - Body ground	Ignition switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between front right wheel speed sensor and ABS/ESP control module assembly**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.

b. Start the engine.

c. Drive vehicle at 15 km/h or above, read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.

d. Check if same DTC is output.

NO → **System operates normally**

YES

Replace ABS/ESP control module assembly

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DTC	C0037 00	Left Rear Wheel Speed Sensor	No Subtype Information
DTC	C0037 09	Left Rear Wheel Speed Sensor	Component Failures
DTC	C0037 11	Left Rear Wheel Speed Sensor	Circuit Short To Ground
DTC	C0037 12	Left Rear Wheel Speed Sensor	Circuit Short To Battery
DTC	C0037 13	Left Rear Wheel Speed Sensor	Circuit Open
DTC	C0037 29	Left Rear Wheel Speed Sensor	Signal Invalid

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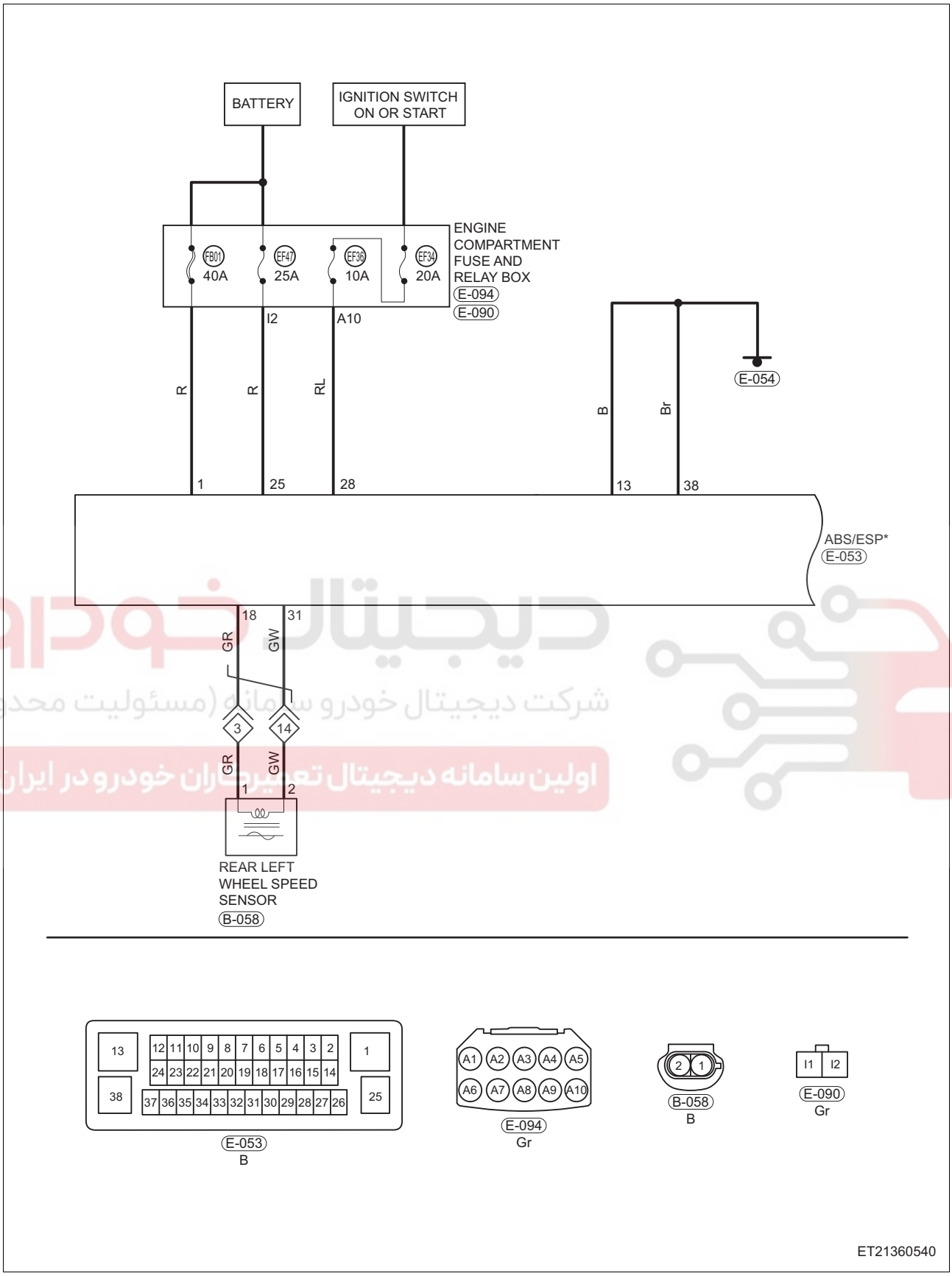

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0037 00	Left Rear Wheel Speed Sensor	This DTC occurs when any of following conditions is met: 1. ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to ground. 2. Wheel speed sensor line is open. 3. ABS/ESP control module assembly detects that wheel speed sensor signal wire is short To Battery. 4. ABS/ESP control module assembly detects that wheel speed sensor power supply wire is short to ground. 5. Wheel speed sensor signal is invalid.	• Reverse connection of wheel speed sensor signal wire and power supply wire • Short to ground in wheel speed sensor signal wire • Wheel speed sensor wire is disconnected, or connector loose or broken • Short To Battery in wheel speed sensor signal wire • Short to ground in wheel speed sensor power supply wire • Sensor head or connector pin is damaged • Wheel speed sensor is interfered by outside magnetic field (wheel or axle not demagnetized) • Wheel speed sensor body malfunction • Ring gear is not installed, missing teeth, dirty, demagnetized, or off-centered • Excessive clearance between sensor and ring gear • Wrong number of ring gear teeth • Tire size is not as specified • ABS/ESP control module assembly is damaged
C0037 09	Left Rear Wheel Speed Sensor		
C0037 11	Left Rear Wheel Speed Sensor		
C0037 12	Left Rear Wheel Speed Sensor		
C0037 13	Left Rear Wheel Speed Sensor		
C0037 29	Left Rear Wheel Speed Sensor		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check rear left wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the rear left wheel speed sensor connector B-058.
d. Check if wire harnesses are worn, pierced, pinched or partially broken.
e. Check for broken, bent, protruded or corroded terminals.
f. Check if related connector terminal contact pins are in good condition.

NG → **Repair of replace rear left wheel speed sensor wire harness and connector**

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OK

2	Check installation of rear left wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check rear left wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between installation position of rear left wheel speed sensor and rear axle hub ring gear.
e. Check installation position of rear left wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace rear left wheel speed sensor**

OK

3	Check rear left wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive vehicle straight ahead, and read datastream of rear left wheel speed sensor with X-431 3G diagnostic tester.
c. Check if data change of rear left wheel speed sensor matches that of other wheel speed sensors.

NG → **Replace rear left wheel speed sensor**

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OK

4	Check rear left hub ring gear

a. Remove the rear left hub assembly.
b. Check for foreign matter, missing teeth or damage on rear left hub ring gear.
c. Check if rear left hub assembly is securely installed.

NG → **Replace rear left hub ring gear**

OK

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5	Check wire harness and connector (rear left wheel speed sensor - ABS/ESP control module assembly)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

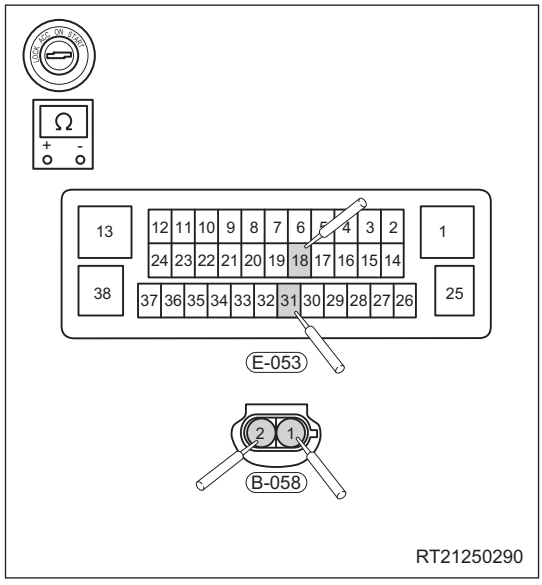
c. Disconnect the ABS/ESP control module assembly connector E-053.

d. Disconnect the rear left wheel speed sensor connector B-058.

e. Using a digital multimeter, check for continuity between terminals of connector E-053 and connector B-058 to check if there is an open in wire harness and connector according to table below.

Standard Condition

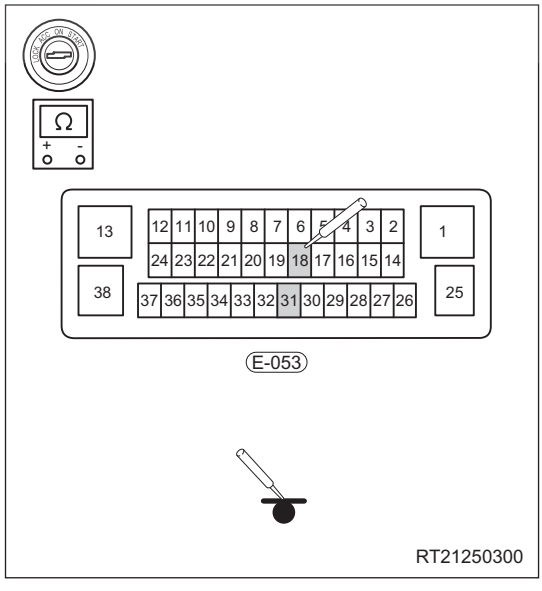
Multimeter Connection	Condition	Specified Condition
E-053 (18) - B-058 (1)	Always	Continuity
E-053 (31) - B-058 (2)	Always	Continuity
E-053 (31) - B-058 (1)	Always	No continuity
E-053 (18) - B-058 (2)	Always	No continuity
B-058 (1) - B-058 (2)	Always	No continuity
E-053 (18) - E-053 (31)	Always	No continuity



f. Using a digital multimeter, check for continuity between connector E-053 and body ground to check if rear left wheel speed sensor is short to ground according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (18) - Body ground	Always	No continuity
E-053 (31) - Body ground	Always	No continuity



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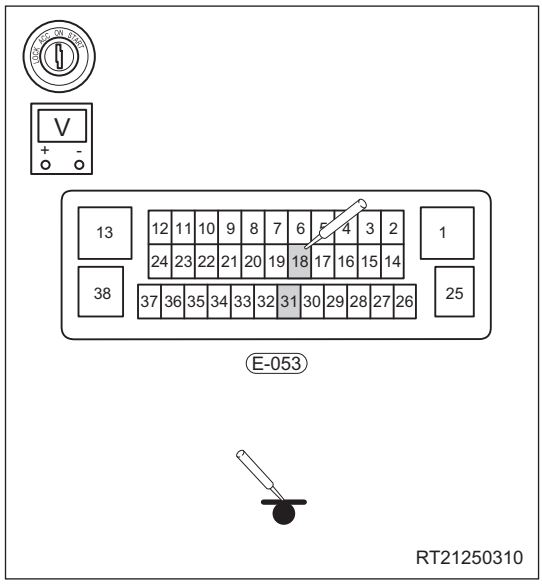
g. Connect the negative battery cable.

h. Turn ignition switch to ON.

i. Using a digital multimeter, measure voltage between connector E-053 and body ground to check if rear left wheel speed sensor is short To Battery according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (18) - Body ground	Ignition switch ON	Approx. 0 V
E-053 (31) - Body ground	Ignition switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between rear left wheel speed sensor and ABS/ESP control module assembly**

OK

6 Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.

b. Start the engine.

c. Drive vehicle at 15 km/h or above, read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.

d. Check if same DTC is output.

NO → **System operates normally**

YES

Replace ABS/ESP control module assembly

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DTC	C003A 00	Right Rear Wheel Speed Sensor	No Subtype Information
DTC	C003A 09	Right Rear Wheel Speed Sensor	Component Failures
DTC	C003A 11	Right Rear Wheel Speed Sensor	Circuit Short To Ground
DTC	C003A 12	Right Rear Wheel Speed Sensor	Circuit Short To Battery
DTC	C003A 13	Right Rear Wheel Speed Sensor	Circuit Open
DTC	C003A 29	Right Rear Wheel Speed Sensor	Signal Invalid

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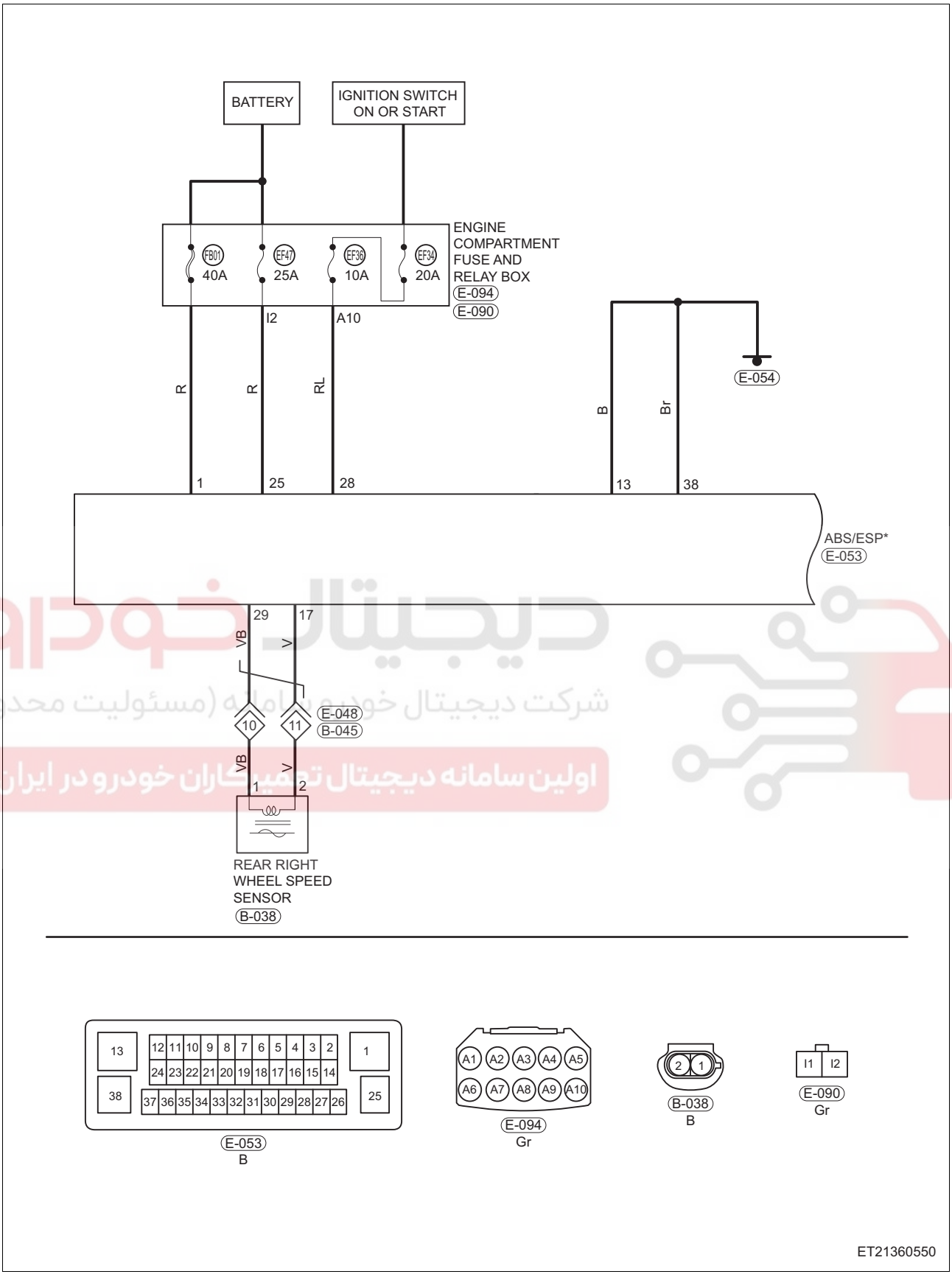

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C003A 00	Right Rear Wheel Speed Sensor	These DTC occur when any of following conditions is met: 1. ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to ground. 2. Wheel speed sensor wire is open. 3. ABS/ESP control module assembly detects that wheel speed sensor signal wire is short To Battery. 4. ABS/ESP control module assembly detects that wheel speed sensor power supply wire is short to ground. 5. Wheel speed sensor signal is invalid.	• Reverse connection of wheel speed sensor signal wire and power supply wire • Short to ground in wheel speed sensor signal wire • Wheel speed sensor wire is disconnected, or connector loose or broken • Short To Battery in wheel speed sensor signal wire • Short to ground in wheel speed sensor power supply wire • Sensor head or connector pin is damaged • Wheel speed sensor is interfered by outside magnetic field (wheel or axle not demagnetized) • Wheel speed sensor body malfunction • Ring gear is not installed, missing teeth, dirty, demagnetized, or off center • Excessive clearance between sensor and ring gear • Wrong number of ring gear teeth • Tire size is not as specified • ABS/ESP control module assembly is damaged
C003A 09	Right Rear Wheel Speed Sensor		
C003A 11	Right Rear Wheel Speed Sensor		
C003A 12	Right Rear Wheel Speed Sensor		
C003A 13	Right Rear Wheel Speed Sensor		
C003A 29	Right Rear Wheel Speed Sensor		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check rear right wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the rear right wheel speed sensor connector B-038.
d. Check if wire harnesses are worn, pierced, pinched or partially broken.
e. Check for broken, bent, protruded or corroded terminals.
f. Check if related connector terminal contact pins are in good condition.

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NG → **Repair or replace rear right wheel speed sensor wire harness and connector**

OK

2	Check installation of rear right wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check rear right wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between installation position of rear right wheel speed sensor and rear axle hub ring gear.
e. Check installation position of rear right wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, and clean or replace rear right wheel speed sensor**

OK

3	Check rear right wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive vehicle straight ahead, and read datastream of rear right wheel speed sensor with X-431 3G diagnostic tester.
c. Check if data change of rear right wheel speed sensor matches that of other wheel speed sensors.

NG → **Replace rear right wheel speed sensor**

OK

4	Check rear right hub ring gear

a. Remove the rear right hub assembly.
b. Check for foreign matter, missing teeth or damage on rear right hub ring gear.
c. Check if rear right hub assembly is securely installed.

NG → **Replace rear right hub ring gear**

OK

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5	Check wire harness and connector (rear right wheel speed sensor - ABS/ESP control module assembly)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

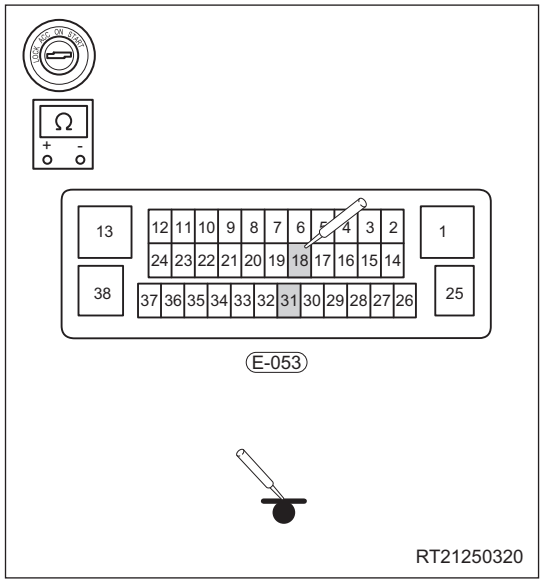
c. Disconnect the ABS/ESP control module assembly connector E-053.

d. Disconnect the rear right wheel speed sensor connector B-038.

e. Using a digital multimeter, check for continuity between terminals of connector E-053 and connector B-038 to check if there is an open in wire harness and connector according to table below.

Standard Condition

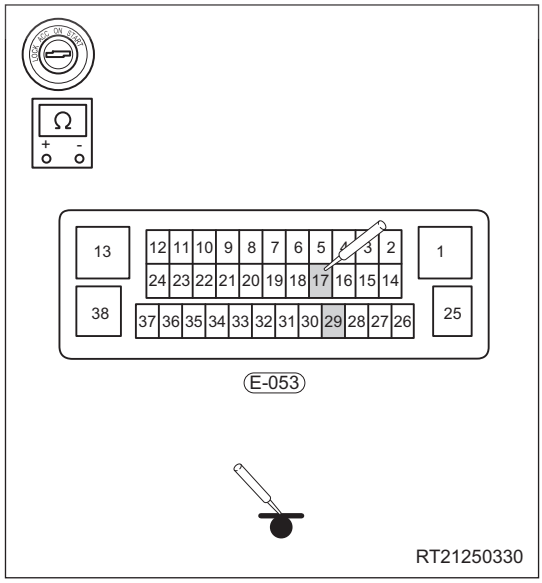
Multimeter Connection	Condition	Specified Condition
E-053 (29) - B-067 (1)	Always	Continuity
E-053 (17) - B-067 (2)	Always	Continuity
E-053 (17) - B-067 (1)	Always	No continuity
E-053 (29) - B-067 (2)	Always	No continuity
B-038 (1) - B-038 (2)	Always	No continuity
E-053 (17) - E-053 (29)	Always	No continuity



f. Using a digital multimeter, check for continuity between connector E-053 and body ground to check if rear right wheel speed sensor is short to ground according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (17) - Body ground	Always	No continuity
E-053 (29) - Body ground	Always	No continuity



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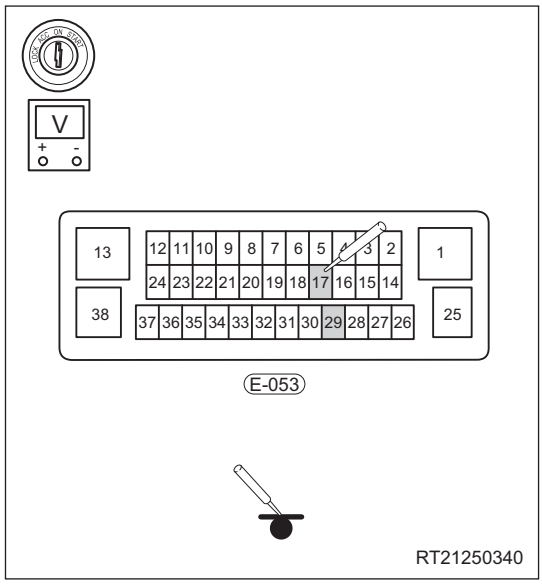
g. Connect the negative battery cable.

h. Turn ignition switch to ON.

i. Using a digital multimeter, measure voltage between connector E-053 and body ground to check if rear right wheel speed sensor is short To Battery according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (17) - Body ground	Ignition switch ON	Approx. 0 V
E-053 (29) - Body ground	Ignition switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between rear right wheel speed sensor and ABS/ESP control module assembly**

OK

6 Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.

b. Start the engine.

c. Drive vehicle at 15 km/h or above, and read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.

d. Check if same DTC is output.

NO → **System operates normally**

YES

Replace ABS/ESP control module assembly

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DTC	C0051 29	Steering Wheel Position Sensor (ESP Only)	Signal Invalid
DTC	C0051 54	Steering Wheel Position Sensor (ESP Only)	Missing Calibration
DTC	C0051 64	Steering Wheel Position Sensor (ESP Only)	Signal Failures
DTC	U0126 00	Lost Communication with Steering Angle Sensor Module (ESP Only)	No Subtype Information
DTC	U0428 00	Invalid Data Received From Steering Angle Sensor Module (ESP Only)	No Subtype Information

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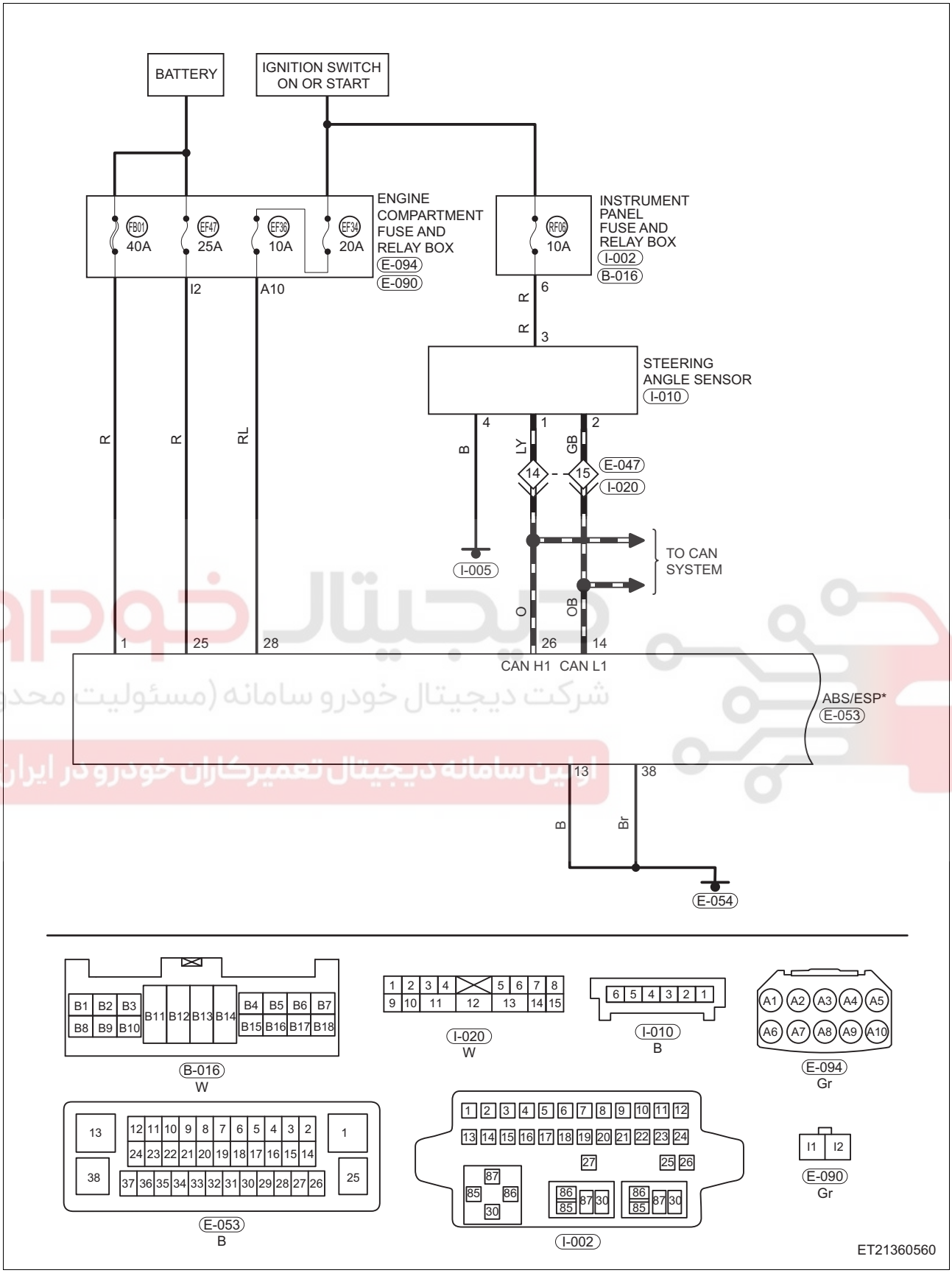

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0051 29	Steering Wheel Position Sensor (ESP Only)	This DTC occurs when any of following conditions is met: 1. Steering wheel angle sensor is unmatched (central point is not found). 2. Steering wheel angle sensor signal is abnormal. 3. Steering wheel angle sensor signal is interrupted.	• Steering angle sensor is uncalibrated • Short or open in steering angle sensor line • Steering angle sensor is damaged
C0051 54	Steering Wheel Position Sensor (ESP Only)		
C0051 64	Steering Wheel Position Sensor (ESP Only)		
U0126 00	Lost Communication with Steering Angle Sensor Module (ESP Only)		
U0428 00	Invalid Data Received From Steering Angle Sensor Module (ESP Only)		

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CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check calibration of steering angle sensor

a. Turn ignition switch to ON.
b. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
c. Perform steering angle sensor calibration again according to instruction on diagnostic tester.
d. Use X-431 3G diagnostic tester to clear DTC.
e. Start the engine.
f. Drive vehicle at 15 km/h or above, and read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.
g. Check if same DTC is output.

NO → **Steering angle sensor is uncalibrated**

YES

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2	Check wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect ABS/ESP control module assembly connector E-053 and steering angle sensor connector I-010.
d. Check if wire harnesses are worn, pierced, pinched or partially broken.
e. Check for broken, bent, protruded or corroded terminals.
f. Check if related connector terminal contact pins are in good condition.

NG → **Repair or replace body/instrument panel wire harness and connector**

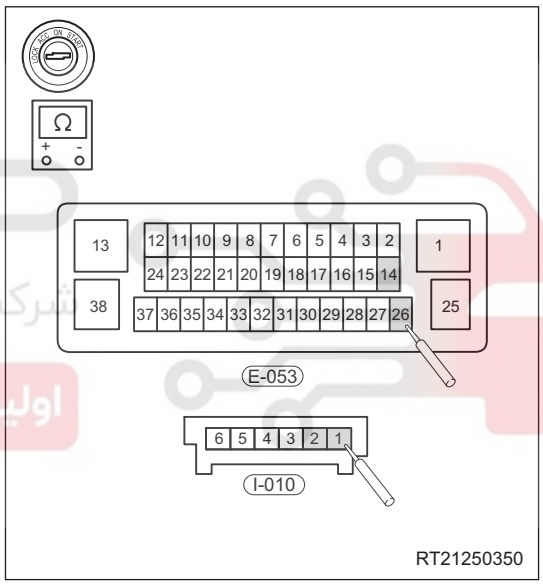
OK

3	Check CAN communication control circuit (ESP - steering angle sensor)

a. Turn ignition switch to LOCK, disconnect the negative battery cable and wait for 90 seconds at least.
b. Disconnect the ABS/ESP control module assembly connector E-053.
c. Disconnect the steering angle sensor connector I-010.
d. Using a digital multimeter, check for continuity between terminals of connector I-010 and connector E-053 to check if there is an open in CAN communication circuit according to table below.

Standard Condition

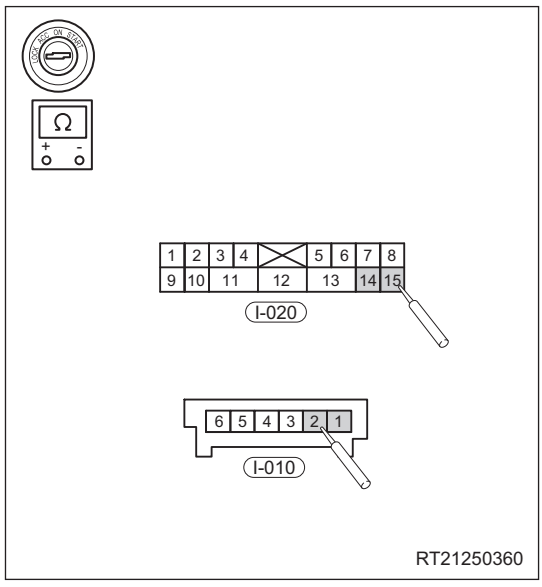
Multimeter Connection	Condition	Specified Condition
I-010 (1) - E-053 (26)	Always	Continuity
I-010 (2) - E-053 (14)	Always	Continuity



e. Using a digital multimeter, check for continuity between terminals of connector I-010 and connector I-020 to check if there is an open in CAN communication circuit according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
I-010 (2) - I-020 (15)	Always	Continuity
I-010 (1) - I-020 (14)	Always	Continuity



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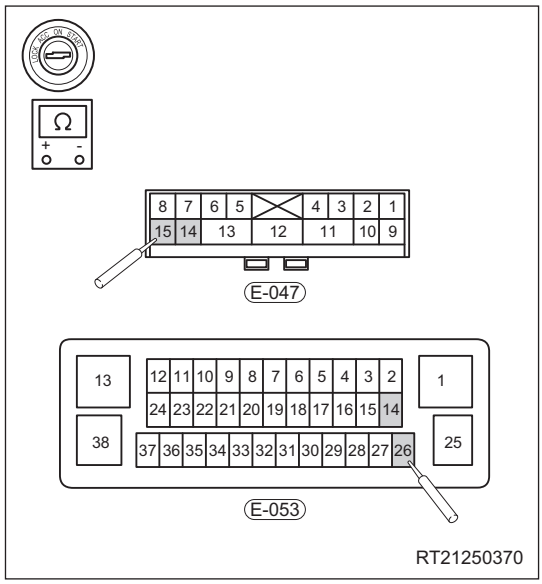
f. Using a digital multimeter, check for continuity between terminals of connector E-047 and connector E-053 to check if there is an open in CAN communication circuit according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-047 (15) - E-053 (26)	Always	Continuity
E-047 (14) - E-053 (14)	Always	Continuity



NG → **Repair or replace instrument panel/body wire harness and connector**

OK

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4	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.
b. Start the engine.
c. Drive vehicle at 15 km/h or above, and read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if same DTC is output.

NO → **System operates normally**

YES

Replace steering angle sensor and recalibrate

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DTC	C006B 00	Stability System Active Too Long (ESP Only)

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C006B 00	Stability System Active Too Long (ESP Only)	This DTC occurs when following conditions are met: 1. ABS receives command to continue operating (more than 1 minute). 2. ESP receives command to continue operating (more than 10 seconds).	• Excessive wheel speed difference • Sensor signal error • ABS/ESP control module assembly is damaged

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect all wheel speed sensor connectors and steering angle sensor connector.
d. Check if wire harnesses are worn, pierced, pinched or partially broken.
e. Check for broken, bent, protruded or corroded terminals.
f. Check if related connector terminal contact pins are in good condition.

NG → **Repair or replace related wire harness and connector**

OK

2	Check installation of wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between installation position of wheel speed sensor and hub ring gear.
e. Check installation position of wheel speed sensor for dirt.

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NG → **Tighten mounting bolt properly, and clean or replace wheel speed sensor**

OK ↓

3	Check wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive vehicle straight ahead, and read datastream of wheel speed sensor with X-431 3G diagnostic tester.
c. Check if data change of wheel speed sensor matches that of other wheel speed sensors.

NG → **Replace corresponding wheel speed sensor**

OK ↓

4	Check hub ring gear

a. Remove the hub assembly.
b. Check for foreign matter, missing teeth or damage on hub ring gear.
c. Check if hub assembly is securely installed.

NG → **Replace corresponding hub ring gear**

OK ↓

5	Check installation of steering angle sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check if steering angle sensor connector is connected securely.
d. Check if steering angle sensor is installed in place.
e. Check installation position of steering angle sensor for dirt.

NG → **Correctly and securely install, clean or replace steering angle sensor**

OK ↓

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.
b. Start the engine.
c. Drive vehicle at 15 km/h or above, and read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if same DTC is output.

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NO → System operates normally

YES

Replace ABS/ESP control module assembly

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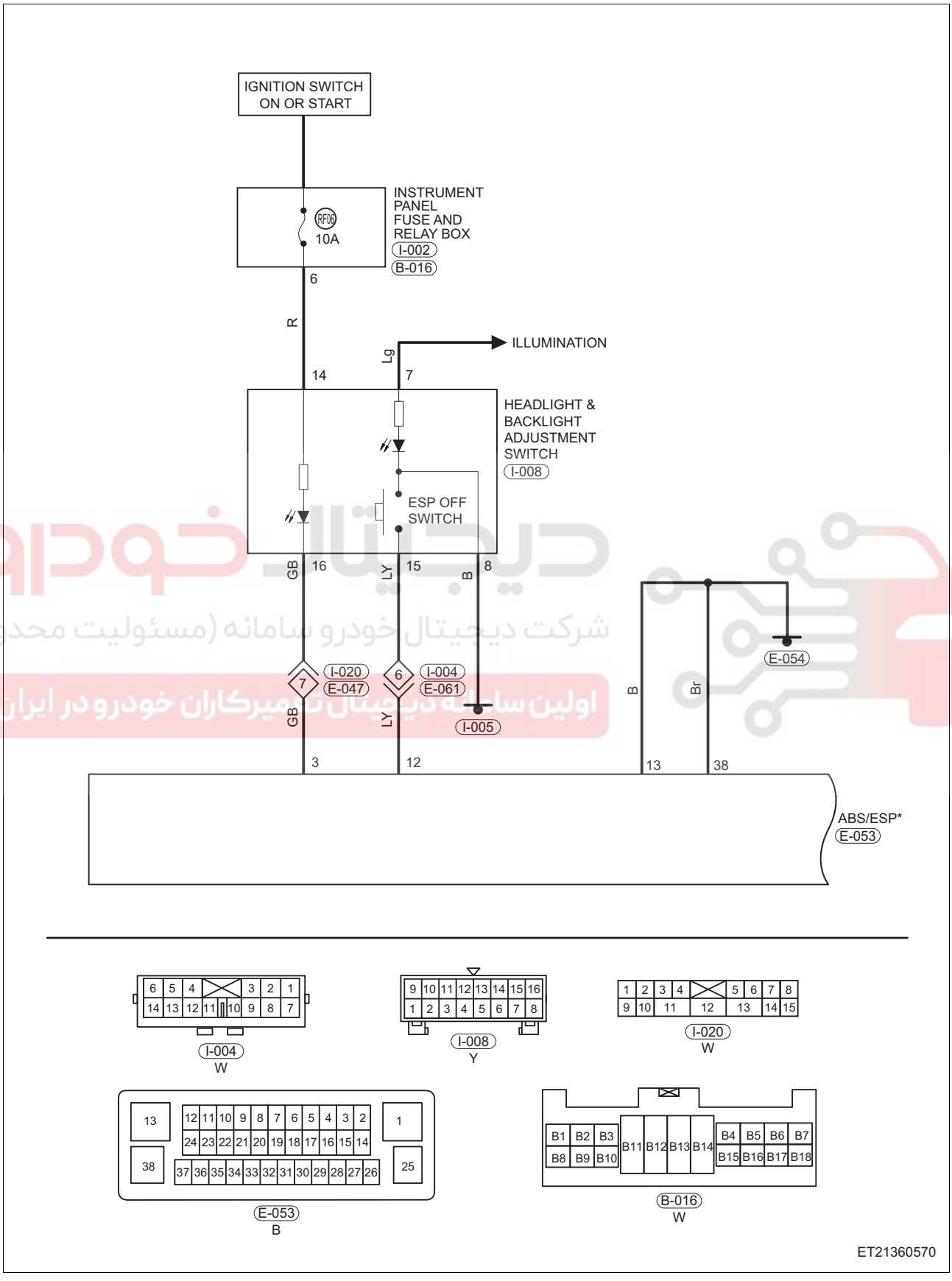
DTC	C0089 04	TCS Disable Switch (ESP Only)	ET21360570



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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0089 04	TCS Switch Invalid (ESP Only)	This DTC occurs when any of following conditions is met: 1. Press and hold ESP OFF switch for more than 10 seconds. 2. During ignition, ESP OFF switch active signal is detected for more than 2 seconds.	• ESP OFF switch is pressed by object • ESP OFF switch is damaged

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check ESP OFF switch

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check if ESP OFF switch is stuck or pressed by other objects.

NG → **Release ESP OFF switch or move away other objects**

OK

2	Check wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check if wire harnesses are worn, pierced, pinched or partially broken.
d. Check for broken, bent, protruded or corroded terminals.
e. Check if related connector terminal contact pins are in good condition.

NG → **Repair or replace body/instrument panel wire harness and connector**

OK

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3	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.
b. Start the engine.
c. Drive vehicle at 15 km/h or above, and read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if same DTC is output.

NO → **System operates normally**

YES ↓

Replace center control integration panel assembly

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DTC	C1000 16	ECU Voltage Supply
DTC	C1000 17	ECU Voltage Supply
DTC	C1001 04	ECU
DTC	C1009 00	ECU Hard Ware Related

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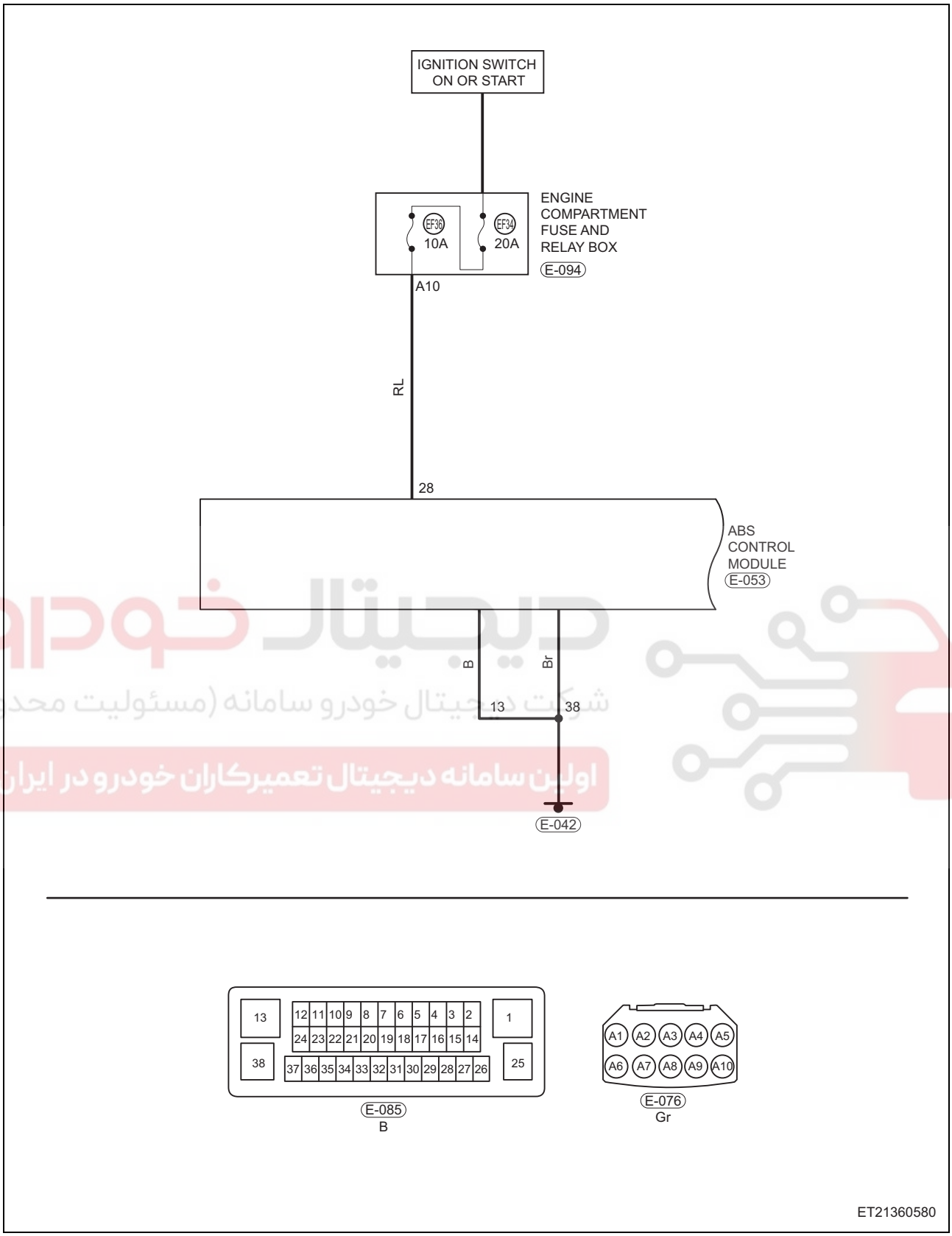

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1000 16	ECU Voltage Supply	These DTC occur when any of following conditions is met: 1. Battery voltage is too high. 2. Battery voltage is too low. 3. Body grounds poorly.	• Fuse malfunction • High or low battery voltage • Charging system malfunction • Wire harness or connector damaged • ABS/ESP control module assembly malfunction
C1001 04	ECU		
C1009 00	ECU Hard Ware Related		
C1000 17	ECU Voltage Supply		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check ABS fuse

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Remove ABS fuse EF-36 (10A) from engine compartment fuse and relay box.
d. Check if fuse is blown.

NG → **Replace ABS fuse**

OK

2	Check battery voltage

a. Using a digital multimeter, measure voltage between positive battery terminal and negative battery terminal.
b. Battery voltage should be between 9 and 16 V.

NG → **Check charging system (See page 27-6)**

OK

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3	Check ABS/ESP control module assembly wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS/ESP control module assembly connector E-053.
d. Check if wire harnesses are worn, pierced, pinched or partially broken.
e. Check for broken, bent, protruded or corroded terminals.
f. Check if related connector terminal contact pins are in good condition.

NG → **Repair or replace ABS/ESP control module assembly wire harness and connector**

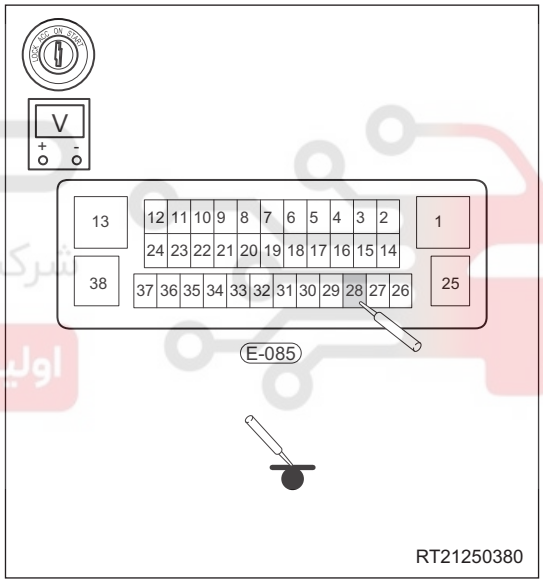
OK →

4	Check wire harness and connector (ABS/ESP control module assembly - battery)

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS/ESP control module assembly connector E-053.
d. Disconnect the negative battery cable.
e. Turn ignition switch to ON.
f. Using a digital multimeter, measure supply voltage between ABS/ESP control module assembly connector E-053 and body ground to check if system power supply circuit is normal according to table below.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
E-085 (28) - Body ground	Ignition switch ON	9 to 16 V



NG → **Repair or replace engine compartment wire harness and connector**

OK →

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5	Check wire harness and connector (ABS/ESP control module assembly - body ground)

a. Turn ignition switch to LOCK.

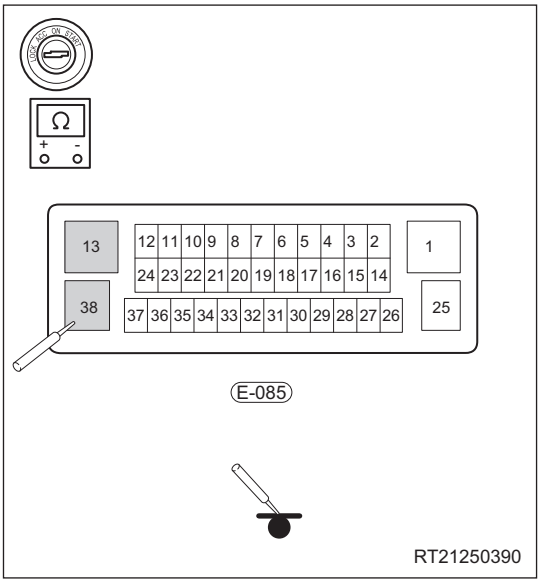
b. Disconnect the negative battery cable.

c. Disconnect the ABS/ESP control module assembly connector E-053.

d. Using a digital multimeter, check for continuity between ABS/ESP control module assembly connector E-053 and body ground to check if system ground circuit is normal according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (13) - Body ground	Always	Continuity
E-053 (38) - Body ground	Always	Continuity



NG → **Repair or replace ABS/ESP control module assembly wire harness and connector**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.

b. Start the engine.

c. Drive vehicle at 15 km/h or above, and read DTC for ABS/ESP control module assembly again with X-431 3G diagnostic tester.

d. Check if same DTC is output.

NO → **System operates normally**

YES

Replace ABS/ESP control module assembly

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DTC	U0005 00	High Speed CAN Communication Bus (+) High	No Subtype Information
DTC	U0007 00	High Speed CAN Communication Bus (-) Low	No Subtype Information
DTC	U0073 00	Control Module Communication Bus Off	No Subtype Information
DTC	U0100 00	Lost Communication with ECM	No Subtype Information
DTC	U0101 00	Lost Communication with TCM (ESP Only)	No Subtype Information
DTC	U0140 00	Lost Communication with BCM	No Subtype Information
DTC	U0401 00	Invalid Data Received from ECM	No Subtype Information
DTC	U0402 00	Invalid Data Received from TCM (ESP Only)	No Subtype Information
DTC	U0422 00	Invalid Data Received from Body Control Module	No Subtype Information

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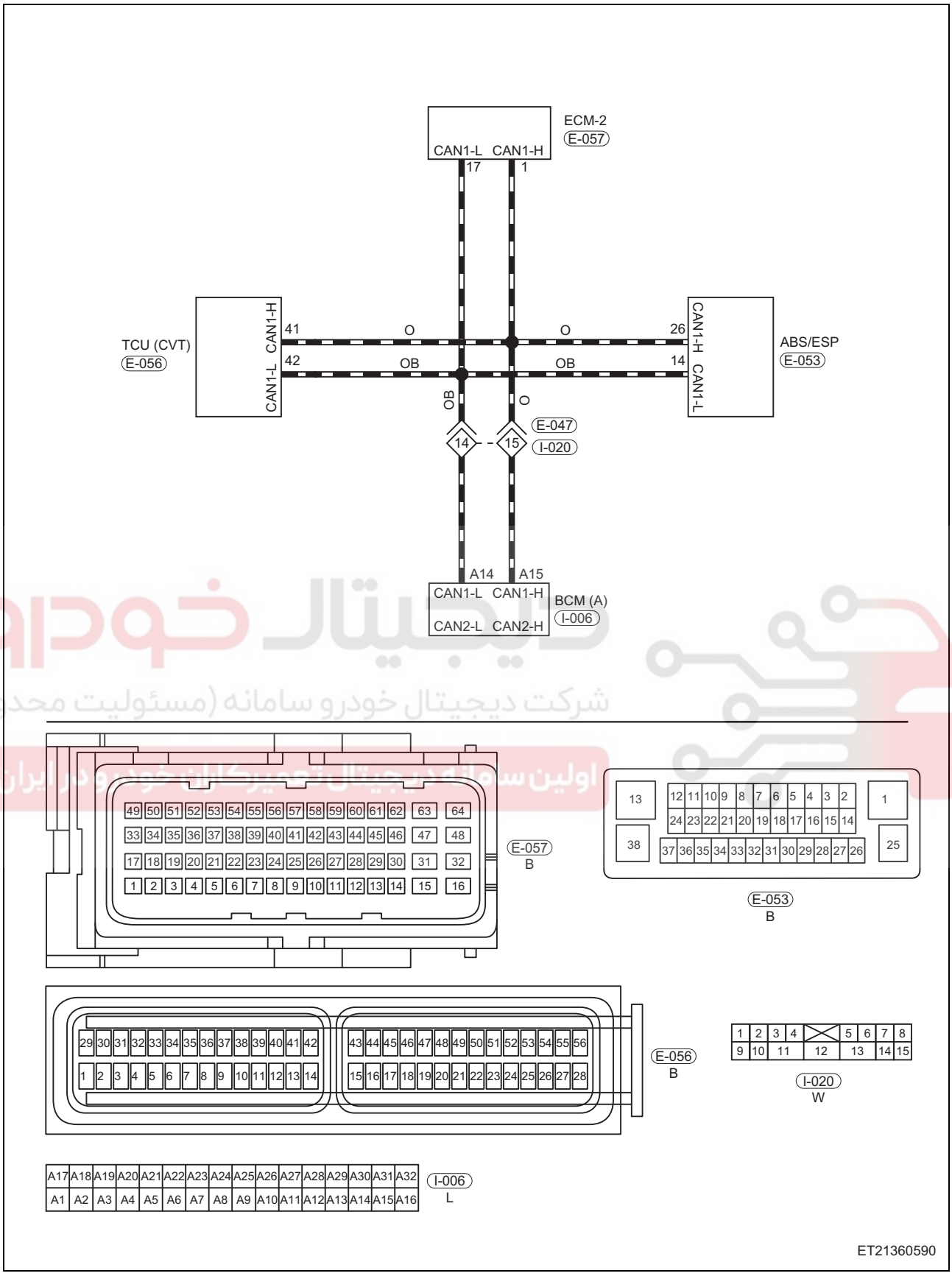

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
U0005 00	High Speed CAN Communication Bus (+) High	This malfunction occur when any of following conditions is met: 1. CAN bus communication, configuration information and line are malfunctioning. 2. ECM overtime. 3. ECM error. 4. TCU overtime. 5. TCU error.	• CAN controller malfunction • CAN configuration information is unmatched • CAN communication is off • CAN bus line malfunction • ECM software version is unmatched • ECM is damaged • TCU software version is unmatched • TCU is damaged • BCM is damaged • ESP (ABS) is damaged
U0007 00	High Speed CAN Communication Bus (-) Low		
U0073 00	Control Module Communication Bus Off		
U0100 00	Lost Communication with ECM		
U0101 00	Lost Communication with TCM (ESP Only)		
U0140 00	Lost Communication with BCM		
U0401 00	Invalid Data Received from ECM		
U0402 00	Invalid Data Received from TCM (ESP Only)		
U0422 00	Invalid Data Received from Body Control Module		
U1000 00	CAN Error Passive		
U0101 00	Lost Communication with TCM (ESP Only)		
U0140 00	Lost Communication with BCM (ESP Only)		
U0401 00	Invalid Data Received from ECM (ESP Only)		
U0402 00	Invalid Data Received from TCM (ESP Only)		
U0422 00	Invalid Data Received from Body Control Module (ESP Only)		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

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Diagnosis Procedure

1	Check wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect ABS/ESP control module assembly connector E-053.
d. Disconnect Engine Control Module (ECM) connectors E-057 and E-058.
e. Disconnect the Transmission Control Module (TCM) connector E-056.
f. Disconnect the Body Control Module (BCM) connector I-006.
g. Check if wire harnesses are worn, pierced, pinched or partially broken.
h. Check for broken, bent, protruded or corroded terminals.
i. Check if related connector terminal contact pins are in good condition.

NG → **Repair or replace body wire harness and connector**

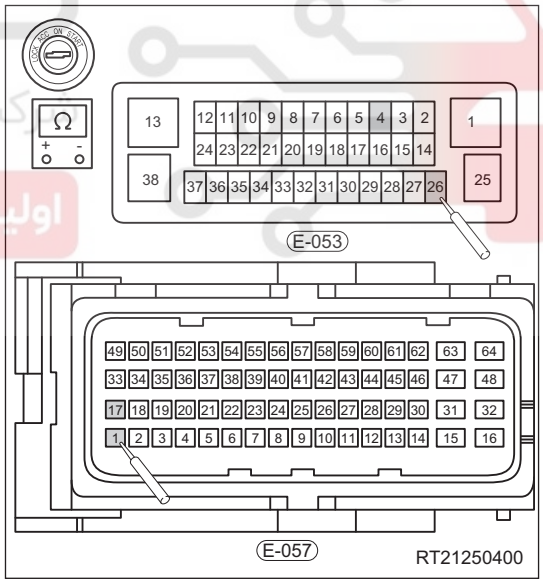
OK

2	Check CAN communication control circuit (ABS/ESP control module assembly - Engine Control Module (ECM))

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS/ESP control module assembly connector E-053.
d. Disconnect the Engine Control Module (ECM) connector E-057.
e. Using a digital multimeter, check for continuity between terminals of connector E-053 and connector E-057 to check if there is an open in CAN communication circuit according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (26) - E-057 (1)	Always	Continuity
E-053 (4) - E-057 (17)	Always	Continuity



NG → **Repair or replace body wire harness and connector**

OK

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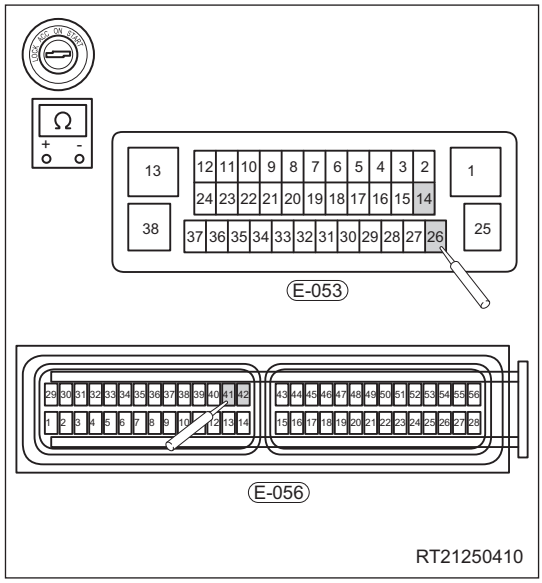
3	Check CAN communication control circuit (ABS/ESP control module assembly - Transmission Control Module (TCM))

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS/ESP control module assembly connector E-053.
d. Disconnect the Transmission Control Module (TCM) connector E-056.
e. Using a digital multimeter, check for continuity between terminals of connector E-053 and connector E-056 to check if there is an open in CAN communication circuit according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (26) - E-056 (41)	Always	Continuity
E-053 (14) - E-056 (42)	Always	Continuity



NG → **Repair or replace body wire harness and connector**

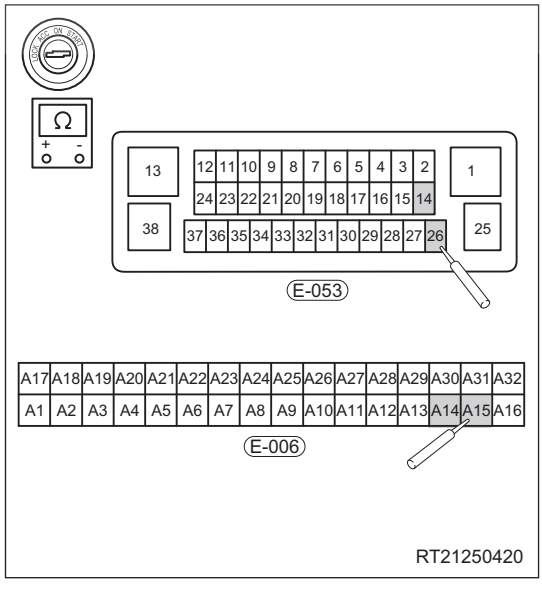
OK ↓

4	Check CAN communication control circuit (ABS/ESP control module assembly - Body Control Module (BCM))

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS/ESP control module assembly connector E-053.
d. Disconnect the Body Control Module (BCM) connector I-006.
e. Using a digital multimeter, check for continuity between terminals of connector E-053 and connector I-006 to check if there is an open in CAN communication circuit according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-053 (26) - I-006 (15)	Always	Continuity
E-053 (14) - I-006 (14)	Always	Continuity



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NG → **Repair or replace body/instrument panel wire harness and connector**

OK

5	Check module software version information

a. Connect the negative battery cable.
b. Turn ignition switch to ON.
c. Use X-431 3G diagnostic tester to read ECM/TCM software version information.
d. Check if there is any abnormality.

NG → **ECM/TCM software version is unmatched**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.
b. Start the engine.
c. Drive vehicle at 15 km/h or above, read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if same DTC is output.

NO → **System operates normally**

YES

Replace ABS/ESP control module assembly

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DTC	C0061 29	Lateral Acceleration Sensor (ESP Only)	Signal Invalid
DTC	C0061 49	Lateral Acceleration Sensor (ESP Only)	Internal Electronic Failure
DTC	C0061 54	Lateral Acceleration Sensor (ESP Only)	Missing Calibration
DTC	C0061 64	Lateral Acceleration Sensor (ESP Only)	Signal Plausibility Failure
DTC	C0062 29	Longitudinal Acceleration Sensor (ESP Only)	Signal Invalid
DTC	C0062 49	Longitudinal Acceleration Sensor (ESP Only)	Internal Electronic Failure
DTC	C0062 54	Longitudinal Acceleration Sensor (ESP Only)	Missing Calibration
DTC	C0062 64	Longitudinal Acceleration Sensor (ESP Only)	Signal Plausibility Failure
DTC	C0063 08	Yaw Rate Sensor (ESP Only)	Bus Signal/Message Failures
DTC	C0063 29	Yaw Rate Sensor (ESP Only)	Signal Invalid
DTC	C0063 31	Yaw Rate Sensor (ESP Only)	No Signal
DTC	C0063 49	Yaw Rate Sensor (ESP Only)	Internal Electronic Failure
DTC	C0063 54	Yaw Rate Sensor (ESP Only)	Missing Calibration
DTC	C0063 64	Yaw Rate Sensor (ESP Only)	Signal Plausibility Failure

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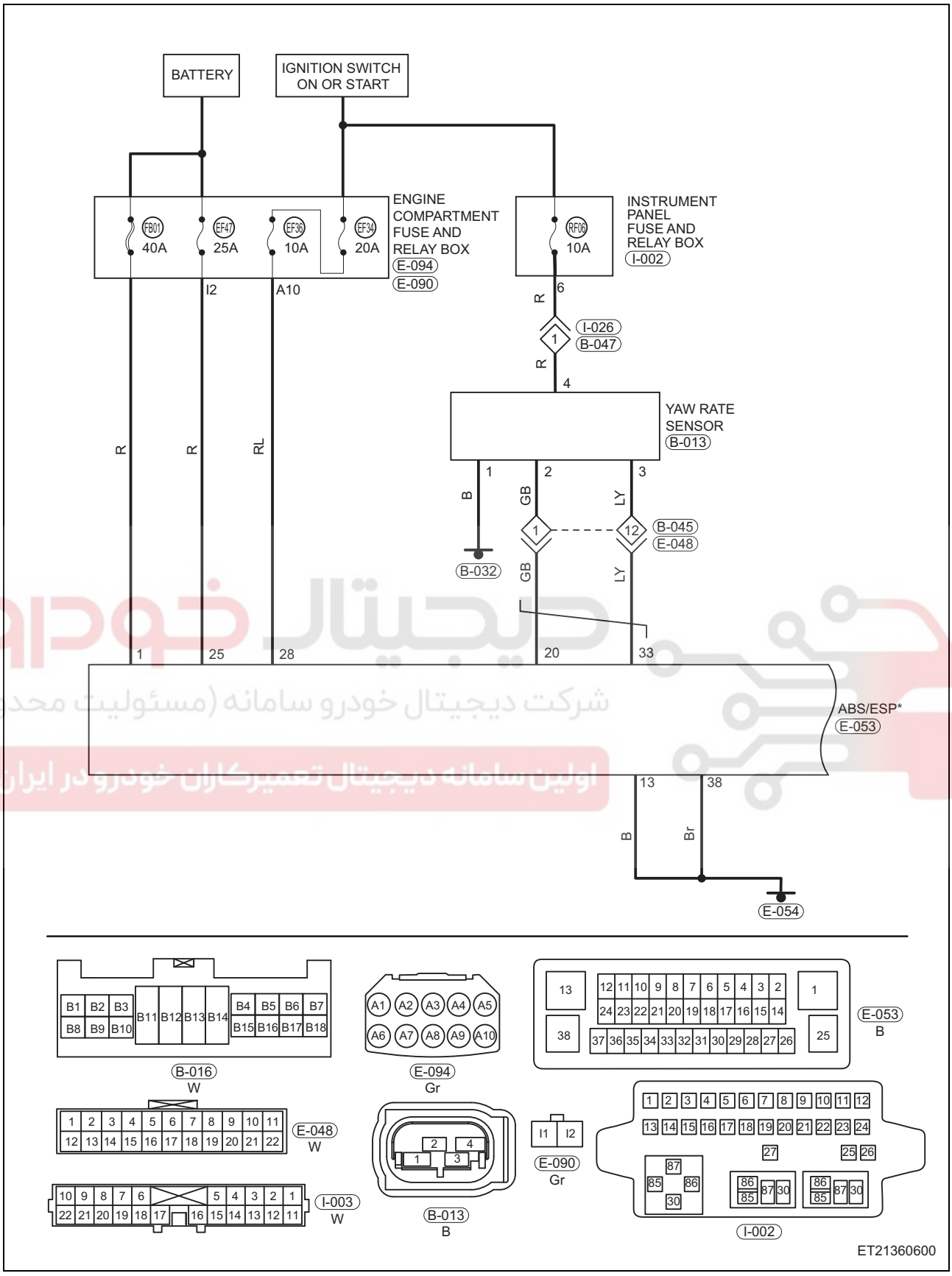

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DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0061 29	Lateral Acceleration Sensor (ESP Only)	These DTC occur when any of following conditions is met: 1. Y&G sensor is uncalibrated. 2. Y&G sensor signal is abnormal. 3. Y&G sensor signal is interrupted.	• Y&G sensor is uncalibrated • Short or open in Y&G sensor line • Y&G sensor is damaged
C0061 49	Lateral Acceleration Sensor (ESP Only)		
C0061 54	Lateral Acceleration Sensor (ESP Only)		
C0061 64	Lateral Acceleration Sensor (ESP Only)		
C0062 29	Longitudinal Acceleration Sensor (ESP Only)		
C0062 49	Longitudinal Acceleration Sensor (ESP Only)		
C0062 54	Longitudinal Acceleration Sensor (ESP Only)		
C0062 64	Longitudinal Acceleration Sensor (ESP Only)		
C0063 08	Yaw Rate Sensor (ESP Only)		
C0063 29	Yaw Rate Sensor (ESP Only)		
C0063 31	Yaw Rate Sensor (ESP Only)		
C0063 49	Yaw Rate Sensor (ESP Only)		
C0063 54	Yaw Rate Sensor (ESP Only)		
C0063 64	Yaw Rate Sensor (ESP Only)		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

Diagnosis Procedure

1	**Check sensor calibration**

a. Turn ignition switch to ON.

b. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).

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c. Perform Y&G sensor calibration again according to instruction on diagnostic tester.
d. Use X-431 3G diagnostic tester to clear DTC.
e. Start the engine.
f. Drive vehicle at 15 km/h or above, read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.
g. Check if same DTC is output.

NO → **Y&G sensor is uncalibrated**

YES

2	Check wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect ABS/ESP control module assembly connector E-053 and Y&G sensor connector B-013.
d. Check if wire harnesses are worn, pierced, pinched or partially broken.
e. Check for broken, bent, protruded or corroded terminals.
f. Check if related connector terminal contact pins are in good condition.

NG → **Repair or replace body wire harness and connector**

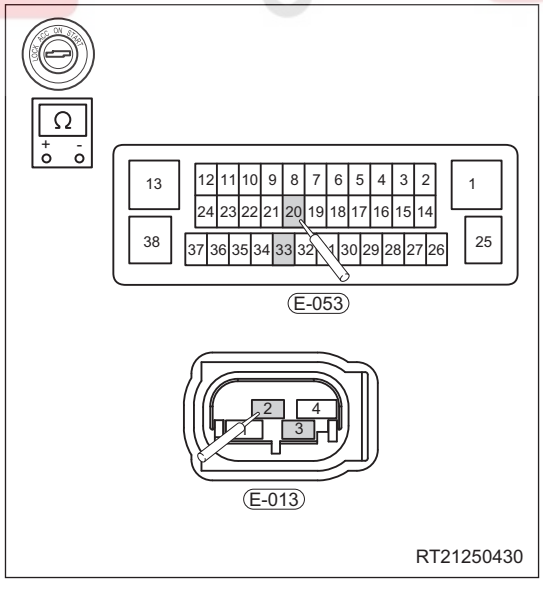
OK

3	Check wire harness between ABS/ESP control module assembly connector and Y&G sensor connector

a. Turn ignition switch to LOCK and disconnect the negative battery cable.
b. Disconnect the ABS/ESP control module assembly connector E-053.
c. Disconnect the Y&G sensor connector B-013.
d. Using a digital multimeter, check for continuity between terminals of connector B-013 and connector E-053 to check if there is an open in CAN communication circuit according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
B-013 (2) - E-053 (20)	Always	Continuity
B-013 (3) - E-053 (33)	Always	Continuity



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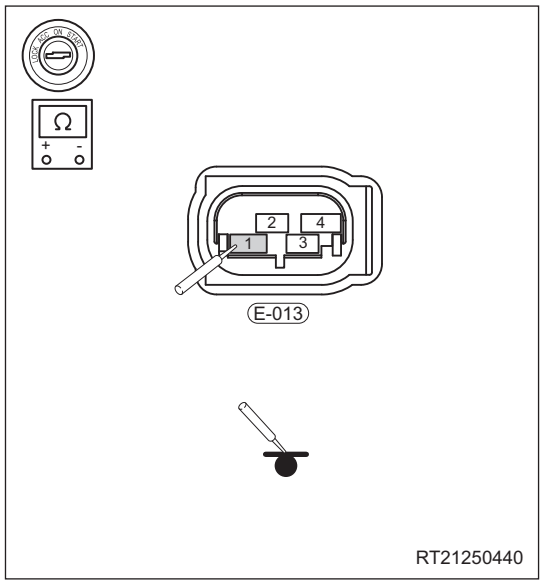
e. Using a digital multimeter, check for continuity between connector B-013 and body ground to check if rear left wheel speed sensor is short to ground according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
B-013 (1) - Body ground	Always	No continuity



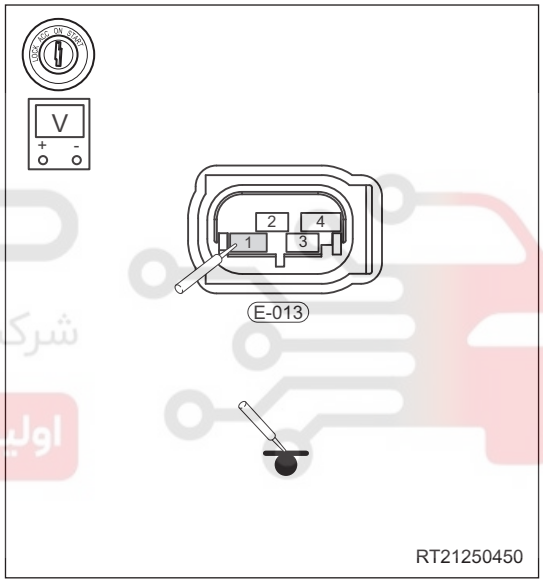
f. Connect the negative battery cable.

g. Turn ignition switch to ON.

h. Using a digital multimeter, measure voltage between connector B-013 and body ground to check if Y&G sensor is short To Battery according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
B-013 (1) - Body ground	Ignition switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between Y&G sensor and ABS/ESP control module assembly**

OK

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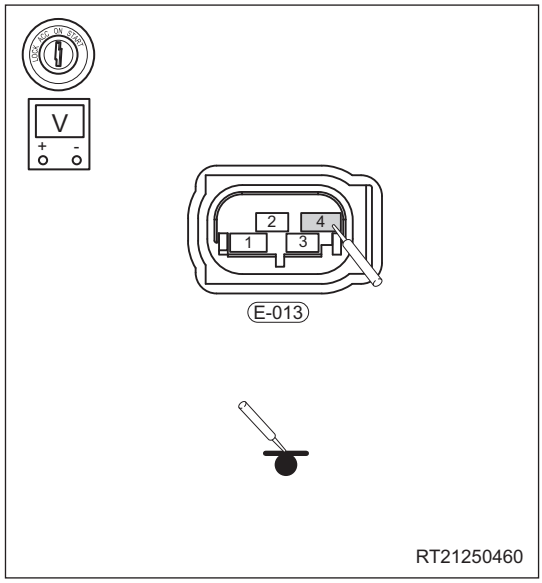
4	Check wire harness and connector (Y&G sensor power supply circuit)

a. Turn ignition switch to LOCK and disconnect the negative battery cable.
b. Disconnect the Y&G sensor connector B-013.
c. Connect the negative battery cable.
d. Turn ignition switch to ON.
e. Using a digital multimeter, measure voltage between connector B-013 and body ground to check if Y&G sensor power supply voltage is normal according to table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
B-013 (4) - Body ground	Ignition switch ON	9 to 16 V



NG → **Repair or replace related wire harness and connector**

OK ↓

5	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear DTC.
b. Start the engine.
c. Drive vehicle at 15 km/h or above, and read ABS/ESP control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if same DTC is output.

NO → **System operates normally**

YES ↓

Replace Y&G sensor and recalibrate

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ON-VEHICLE SERVICE

ABS Bleeding

⚠ WARNING

- When bleeding brake system, wear safety glasses. If brake fluid gets on your eyes or skin, wash off with water immediately.
- DO NOT drop brake fluid on body paint, as brake fluid is corrosive.

CAUTION

- Type of brake fluid as Chery specified (DOT 4) should be used. DO NOT mix brake fluid with other types of brake fluid.
- As brake fluid has strong water absorbability, be sure to place it in the original sealed container.
- To prevent dust and other foreign matter from entering reservoir, wipe it off before removing reservoir cap.

Bleeding procedures for brake system with X-431 3G diagnostic tester are as follows:

1. Make sure all brake lines are installed and tightened properly.
2. Check that battery voltage is normal.
3. Turn ignition switch to LOCK.
4. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
5. Turn ignition switch to ON.
6. Using X-431 3G diagnostic tester, read and clear DTCs stored in ABS/ESP control module assembly.
7. Using X-431 3G diagnostic tester, enter brake control system, select manual bleeding, and then perform operation according to information and procedures displayed on diagnostic tester.

   HINT:
   - If bleeder plug is open, never depress brake pedal repeatedly. Doing so will increase the amount of air in system.
   - Do not drain brake fluid from brake fluid reservoir while bleeding the system. Otherwise, low fluid level in brake fluid reservoir will cause additional air to enter brake system.
   - Always check brake fluid level at all times to ensure that brake fluid level in brake fluid reservoir is always close to MAX level.
8. For X type brake circuit, bleeding order is: rear left wheel, front left wheel, front right wheel, rear right wheel.
9. After bleeding is completed, fill brake fluid reservoir with brake fluid to MAX level.
10. Drive vehicle to perform a road test, and confirm that ABS/ESP system operates normally and brake pedal feels well.

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ABS/ESP Control Module Assembly

Removal

⚠ WARNING

- When repairing ABS/ESP system, first release the high brake fluid pressure in accumulator, to prevent high pressure brake fluid from spraying out and causing injury.
- Operation procedures: turn ignition switch to LOCK first, and then depress and release brake pedal repeatedly until brake pedal becomes hard.
- In addition, never turn ignition switch on before ABS/ESP system is installed completely, to prevent hydraulic pump from being energized to run.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Drain the brake fluid (See page 37-12).

CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

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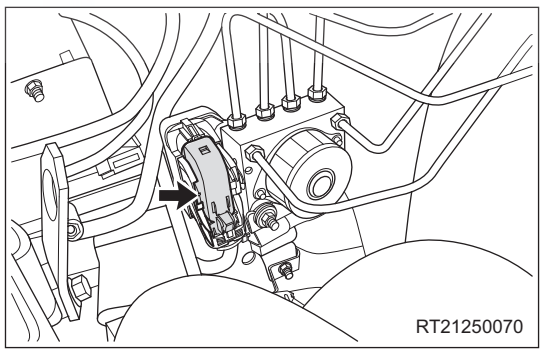
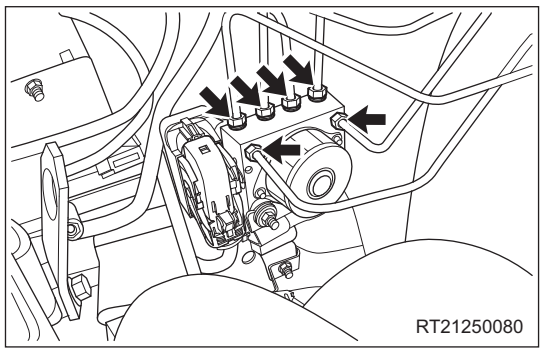
4. Remove the engine trim cover assembly.
5. Remove the ABS/ESP control module assembly.
   a. Press lock portion of ABS/ESP control module assembly connector, pull connector lock bracket upward and disconnect ABS/ESP control module assembly connector (arrow).



   b. Using a fixing wrench, carefully disconnect 6 brake pipe coupling plugs (arrow).
   (Tightening torque: 16 ± 2 N·m)



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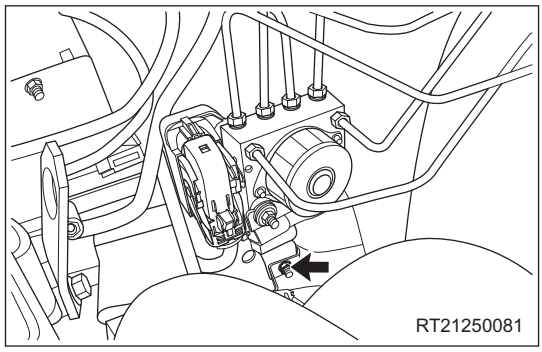
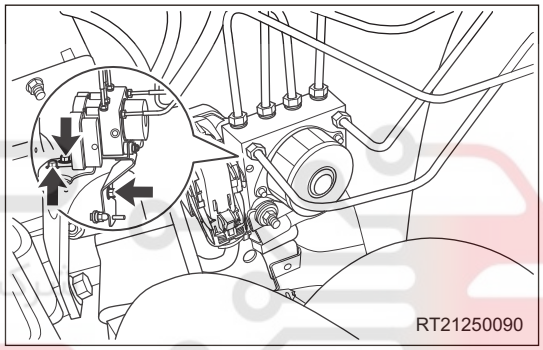
CAUTION

- When removing brake line, prevent foreign matter form entering ABS/ESP control module assembly threaded holes.
- After disconnecting brake line, sealing measure should be taken to prevent foreign matter form entering.

c. Remove coupling nut (arrow) between ABS/ESP control module assembly mounting bracket and body. (Tightening torque: 23 ± 2 N·m)



d. Remove 3 coupling bolts (arrow) between ABS/ESP control module assembly mounting bracket and body. (Tightening torque: 23 ± 2 N·m)



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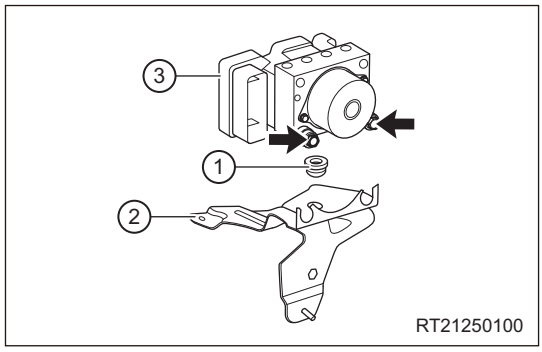
e. Remove the ABS/ESP control module assembly with mounting bracket.

Disassembly

1. Remove the ABS/ESP control module assembly.
   a. Remove coupling nuts (arrow) between lower side of ABS/ESP control module assembly and the mounting bracket. (Tightening torque: 8 ± 2 N·m)
   b. Disengage rubber insulator (1) from bottom of ABS/ESP control module assembly.
   c. Disengage ABS/ESP control module assembly (3) from mounting bracket (2).



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Assembly

Assembly is in the reverse order of disassembly.

CAUTION

- Check insulator for aging or damage. Replace if necessary.

Installation

Installation is in the reverse order of removal.

CAUTION

- ABS/ESP control module assembly contains hydraulic control module and electronic control module. As a unit, both cannot be repaired or replaced individually.
- When installing fixing bolts and nuts, be sure to tighten to specified torques.
- Perform ABS/ESP bleeding procedures for brake system after installation (See page 36-85).
- Using X-431 3G diagnostic tester, enter brake control system, record and clear trouble code, then drive vehicle to perform a road test, confirm that ABS/ESP system operates normally and brake pedal feels well.

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Front Wheel Speed Sensor

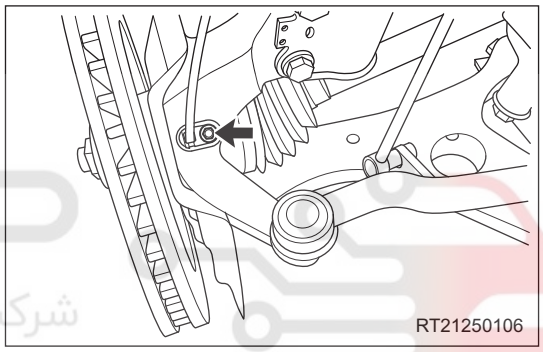
Removal

CAUTION

- Keep wheel speed sensor away from oil or other foreign matters. Otherwise speed signal generated by wheel speed sensor may be inaccurate, or even system may fail to operate normally.

HINT:
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the front left wheel (See page 35-9).
4. Remove the front left wheel speed sensor.
   a. Remove coupling bolt (arrow) between front left wheel speed sensor and front left steering knuckle assembly, and carefully disengage front left wheel speed sensor.
   (Tightening torque: 10 ± 1 N·m)



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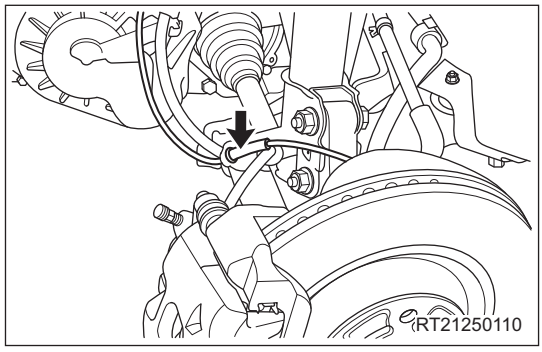
CAUTION

- Keep the head and installation hole of sensor free of foreign matter.

   b. Disengage attachment part (arrow) of front left wheel speed sensor wire harness from front left shock absorber assembly.

   HINT:
   Observe winding direction of sensor wire harness to prevent incorrect installation.



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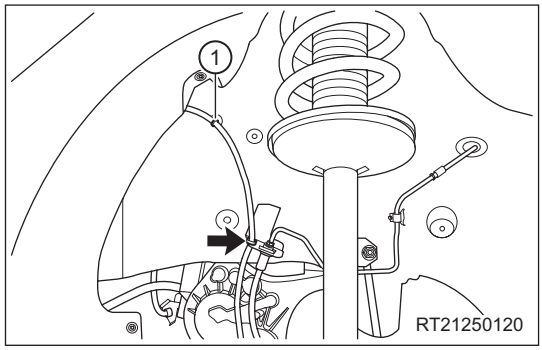
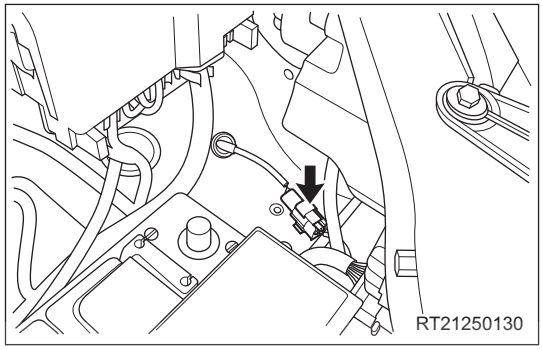
c. Disengage attachment part (arrow) and fixing clip (1) of front left wheel speed sensor wire harness from mounting bracket and body.

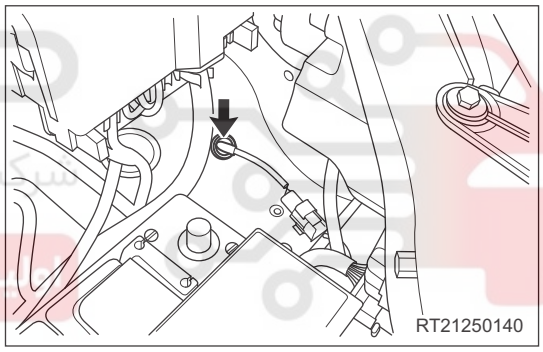
HINT:
Observe winding direction of sensor wire harness to prevent incorrect installation.



d. Disconnect the front left wheel speed sensor wire harness connector (arrow).



e. Disengage front left wheel speed sensor wire harness cover (arrow) from body.



f. Remove the front left wheel speed sensor.

Inspection

1. Check the front wheel speed sensor.
   a. Check front wheel speed sensor surface for breakage, dent or notch.
   b. Check front wheel speed sensor connector or wire harness for scratches, breakage or damage.
   c. If any of above conditions occurs, replace front wheel speed sensor with a new one.

Installation

Installation is in the reverse order of removal.

CAUTION

- When installing coupling bolt, be sure to tighten to specified torque.

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Rear Wheel Speed Sensor

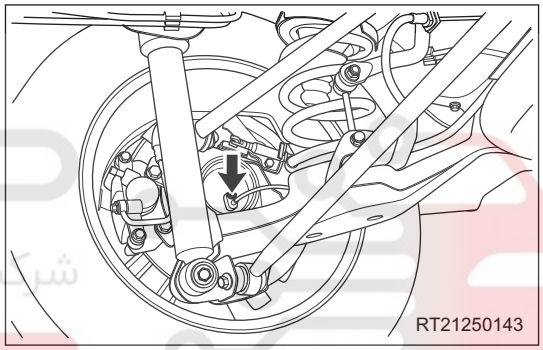
Removal

CAUTION

- Keep wheel speed sensor away from oil or other foreign matters. Otherwise speed signal generated by wheel speed sensor may be inaccurate, or even system may fail to operate normally.

HINT:
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the rear left wheel (See page 35-9).
4. Remove the left C-pillar lower protector assembly (See page 63-23).
5. Remove the rear left wheel speed sensor.
   a. Remove coupling bolt (arrow) between rear left wheel speed sensor and rear left hub bearing, and disengage rear left wheel speed sensor.
   (Tightening torque: 10 ± 1 N·m)



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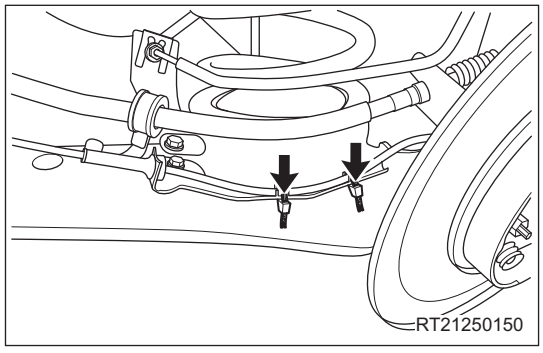
CAUTION

- Keep the head and installation hole of sensor free of foreign matter.

   b. Loosen fixing bands (arrow) from rear left wheel speed sensor wire harness.



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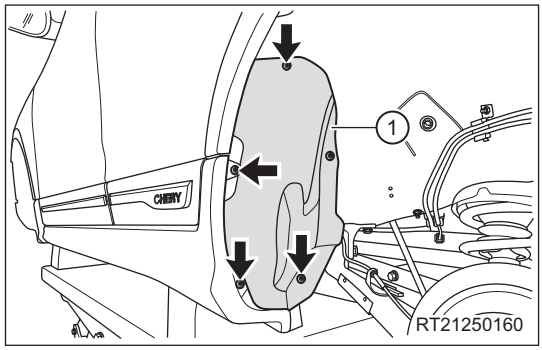
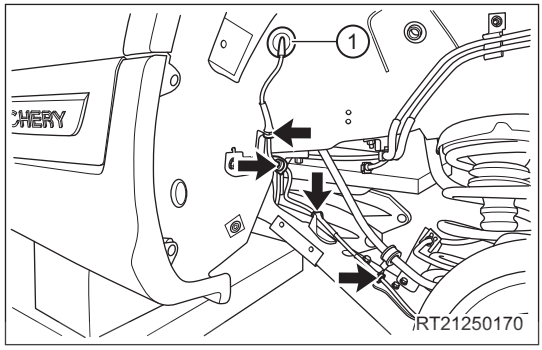
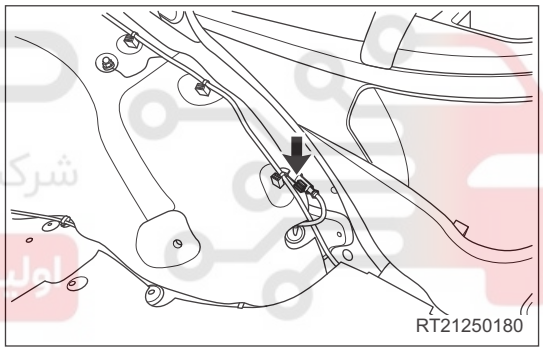
c. Remove 4 fixing screws (arrow) and rear left wheel house front protector assembly (1).



d. Disengage attachment parts (arrow) between rear left wheel speed sensor wire harness and mounting bracket, and disengage wire harness cover (1).



e. Disconnect the rear left wheel speed sensor wire harness connector (arrow).



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f. Remove the rear left wheel speed sensor.

Inspection

1. Check the rear wheel speed sensor.
   a. Check rear wheel speed sensor surface for breakage, dent or notch.
   b. Check rear wheel speed sensor connector or wire harness for scratches, breakage or damage.
   c. If any of above conditions occurs, replace rear wheel speed sensor with a new one.

Installation

Installation is in the reverse order of removal.

CAUTION

- When installing coupling bolt, be sure to tighten to specified torque.

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Steering Angle Sensor

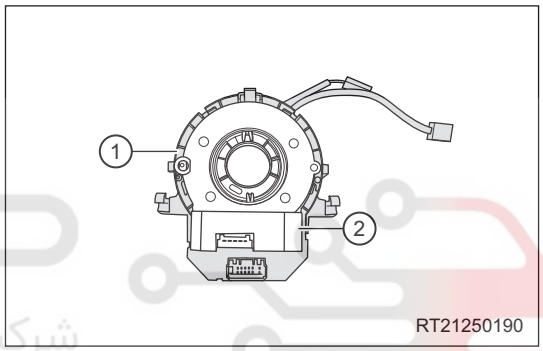
Removal

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.

⚠ WARNING

- Wait at least 90 seconds after disconnecting the negative battery cable to disable supplemental restraint system.

3. Set front wheels to straight-ahead position.
4. Remove the steering wheel assembly (See page 39-10).
5. Remove the combination switch cover assembly (See page 39-13).
6. Remove the steering angle sensor.
   a. Disengage fixing claws of angle sensor, and disengage spiral cable (1) and angle sensor (2).



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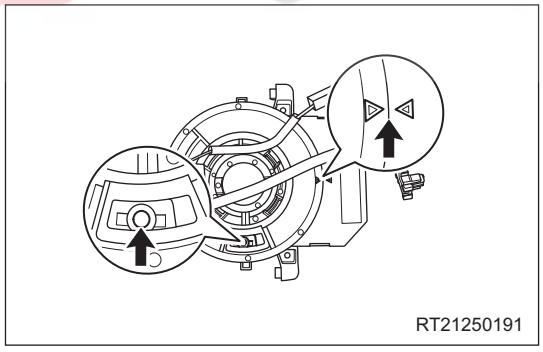
Installation

Installation is in the reverse order of removal.

HINT:

Always install spiral cable correctly according to matchmarks on spiral cable and steering column (slowly and fully turn spiral cable clockwise, then turn it counterclockwise until yellow ball appears in transparent neutral window and arrow marks align with each other), otherwise the spiral cable may be damaged.



CAUTION

- Always install spiral cable correctly according to specified operating instructions.
- DO NOT rotate spiral cable over specified turns to prevent it from breaking.
- Be sure to install fixing claws in place when installing spiral cable.
- Check that horn operates normally after installation.
- Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.

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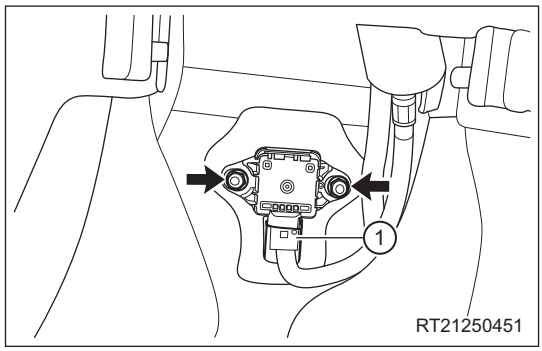
Yaw Rate Sensor

Removal

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the auxiliary fascia console assembly (See page 59-9).
4. Remove the yaw rate sensor.
   a. Disengage fixing claws of angle sensor, and disengage spiral cable (1) and angle sensor (2).



Installation

Installation is in the reverse order of removal.

HINT:
Match and calibrate ESP system after installation.

CAUTION

- Check that ESP operates normally after installation.

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BRAKE

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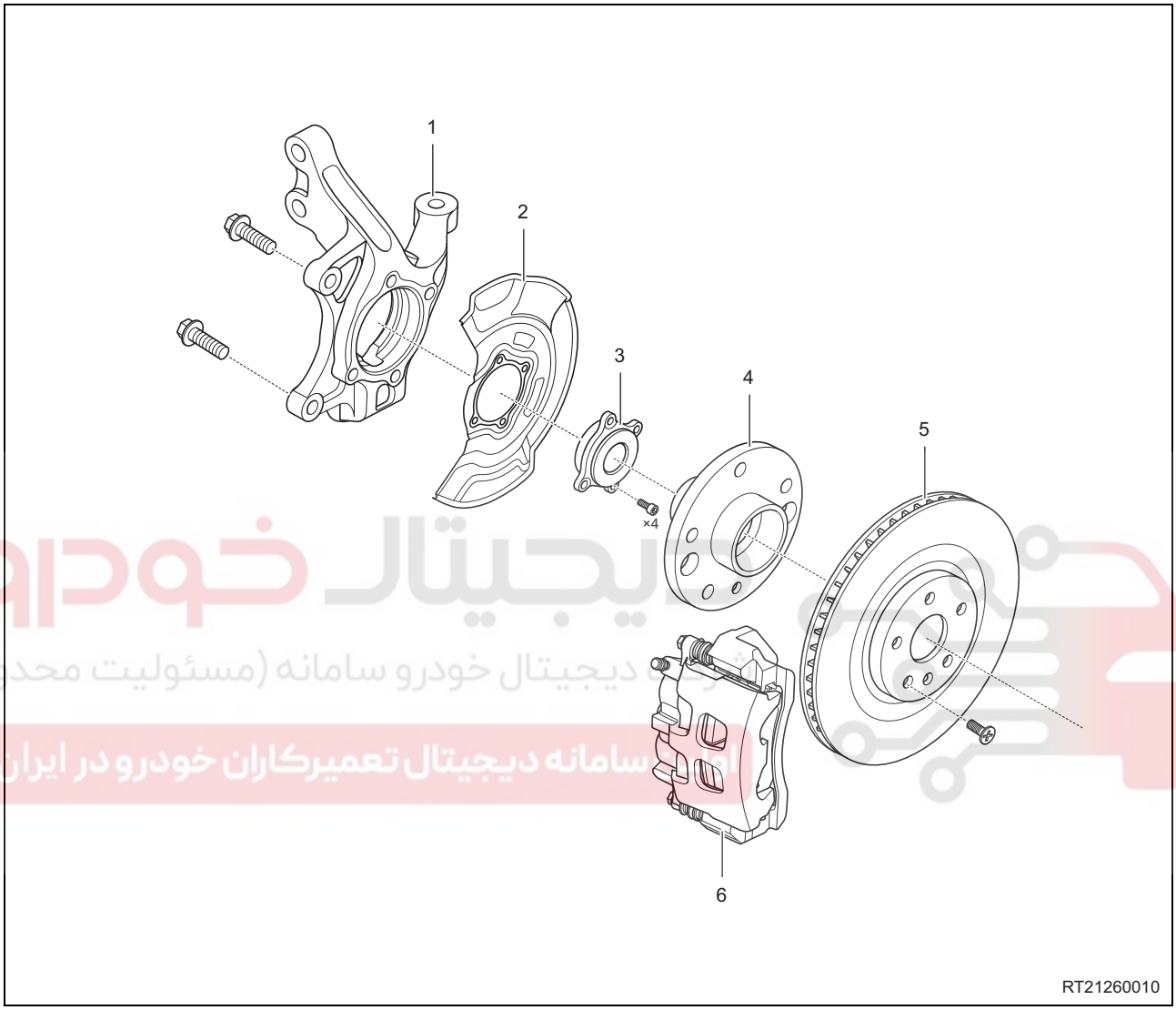
GENERAL INFORMATION

Description

Front Disc Brake Assembly



1 - Front Steering Knuckle	2 - Front Wheel Mudguard
3 - Front Hub Bearing	4 - Front Hub Assembly
5 - Front Brake Disc	6 - Front Brake Caliper Assembly

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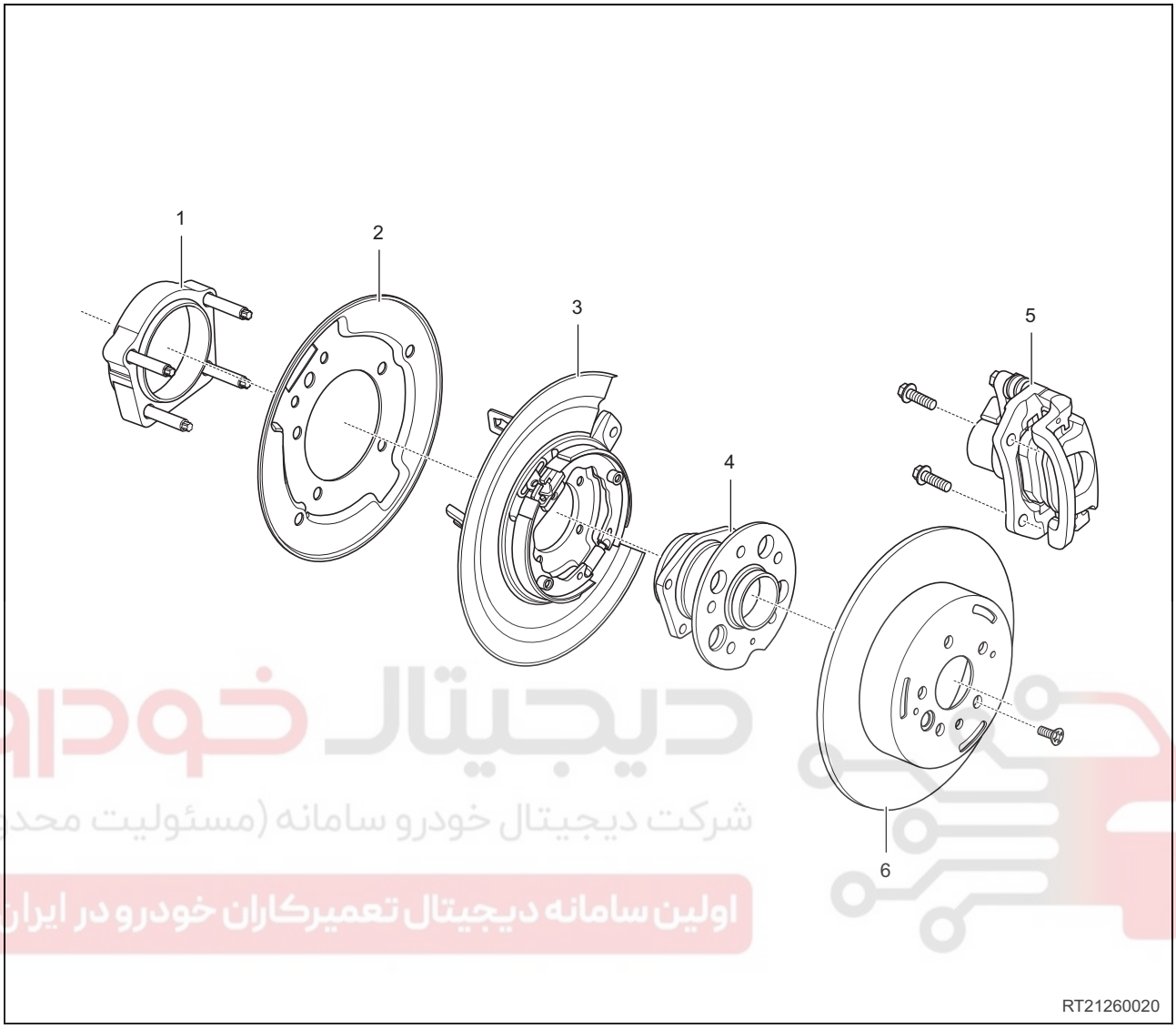
Rear DIH (Drum-in-hat)



1 - Connecting Plate Assembly	2 - Rear Brake Bottom Board
3 - Rear Brake Assembly	4 - Rear Hub Bearing Unit
5 - Rear Brake Caliper Assembly	6 - Rear Brake Disc

Brake system uses following configuration: disc brake is used for front wheels, and DIH (Drum-in-hat) is used for rear wheels (disc brake is used for driving brake, and drum brake is used for parking brake).

Using lever principle, brake pedal pushes pushrod into vacuum booster, which boosts the force of pushrod by using vacuum and then transmits the force to brake master cylinder assembly. Hydraulic pressure, produced in the brake master cylinder assembly, is transmitted to ABS Hydraulic Control Unit (HCU) through brake tube, and then distributed to individual brake calipers. The brake calipers apply force to brake linings using hydraulic pressure. The brake linings will cause wheel speed to decrease or stop depending on amount of brake pressure applied.

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Specifications

Torque Specifications

Description	Torque (N·m)
Wheel Mounting Bolt	110 ± 10
Coupling Nut Between Brake Fluid Reservoir Assembly and Body	9 ± 1
Coupling Plug Between Brake Master Cylinder Assembly and Brake Pipe	16 ± 2
Coupling Nut Between Brake Master Cylinder Assembly and Vacuum Booster Assembly	21 - 25
Coupling Bolt Between Brake Fluid Reservoir Assembly and Brake Master Cylinder Assembly	3 - 5
Coupling Nut Between Vacuum Booster Assembly and Brake Pedal Assembly	25 ± 3
Coupling Nut Between Brake Pedal Assembly and Body	25 ± 3
Coupling Bolt Between Front Brake Caliper Assembly and Front Brake Hose Assembly	27 ± 2
Coupling Bolt Between Front Brake Caliper Assembly and Front Steering Knuckle Assembly	100 ± 10
Front Brake Disc Positioning Screw	10 ± 1
Front Brake Caliper Bleeder Plug	9 - 11
Locating Bolt Between Front Brake Caliper Fixing Bracket and Front Brake Cylinder Assembly	25 ± 3
Coupling Plug Between Front Brake Hose Assembly and Front Brake Pipe	16 ± 2
Coupling Bolt Between Rear Brake Caliper Assembly and Rear Brake Hose Assembly	20 ± 2
Coupling Bolt Between Rear Brake Caliper Assembly and Rear Brake Bottom Board Assembly	100 ± 10
Rear Brake Disc Positioning Screw	10 ± 1
Rear Brake Caliper Bleeder Plug	9 - 11
Locating Bolt Between Rear Brake Caliper Fixing Bracket and Rear Brake Cylinder Assembly	25 ± 3
Coupling Plug Between Rear Brake Hose Assembly and Brake Pipe	16 ± 2

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Front Disc Brake

Description	Standard Thickness (mm)	Minimum Thickness (mm)	Maximum Runout (mm)
Front Brake Disc	25	23	0.06
Front Brake Lining	9.2	2	-

Rear DIH (Drum-in-hat)

Description	Standard Thickness (mm)	Minimum Thickness (mm)	Maximum Runout (mm)
Rear Brake Disc	10	8	0.06
Rear Brake Lining	8.2	2	-

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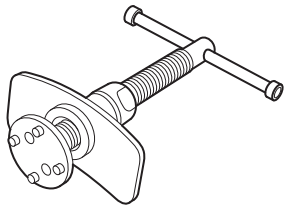
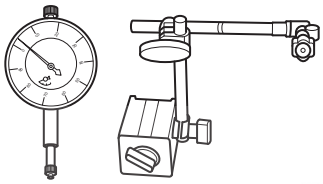
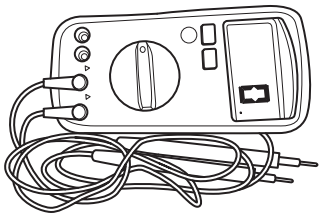
Tools

Special Tool

Brake Caliper Piston Pressing Tool	 RCH0000053

General Tools

Dial Indicator and Magnetic Holder	 RCH0000023
Vernier Caliper	 RCH0000019
Digital Multimeter	 RCH0000002

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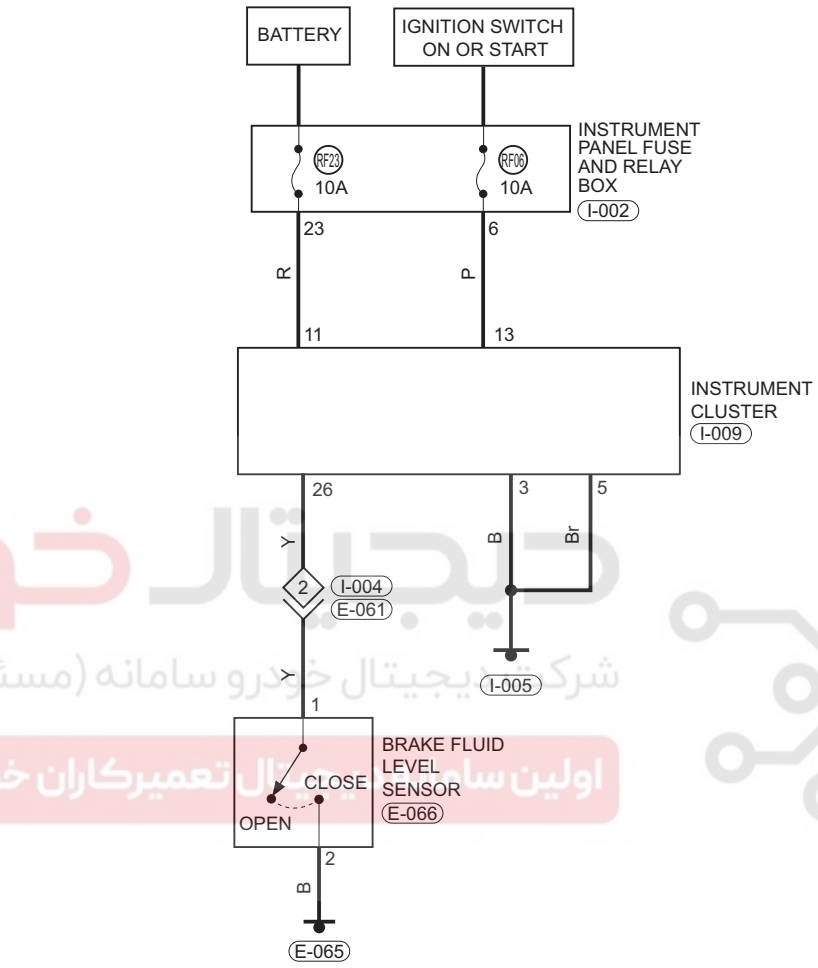
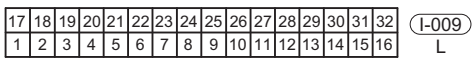
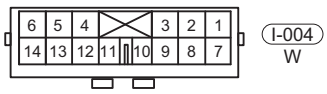
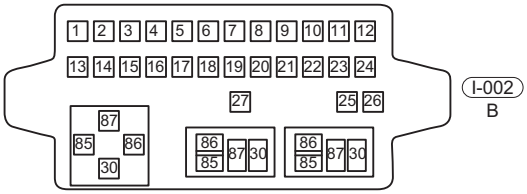
Circuit Diagram

Brake System









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DIAGNOSIS & TESTING

Problem Symptoms Table

HINT:
Use the table below to help determine the cause of the problem symptoms. Check each suspected area in sequence. Repair or replace the faulty components, or adjust as necessary.

Symptom	Suspected Area	See page
Noise in brake	Front brake lining (cracked, deformed, dirty or burnished)	37-33
	Rear brake lining (cracked, deformed, dirty or burnished)	37-45
	Front disc brake locating bolt guide pin (worn)	37-33
	Rear disc brake locating bolt guide pin (worn)	37-44
	Front brake caliper assembly fixing bolt (loose)	37-37
	Rear brake caliper assembly fixing bolt (loose)	37-44
	Front brake disc (scored)	37-31
	Rear brake disc (scored)	37-45
	Excessive brake disc runout	37-44
	Brake shoe stopper spring (damaged)	38-17
	Brake shoe return tension spring (damaged or elasticity insufficient)	38-17
	Foreign matter on front brake disc	-
	Foreign matter on rear brake disc	-
Hard pedal but brake inefficient	Front brake lining (worn, cracked, deformed, oily or burnished)	37-33
	Rear brake lining (worn, cracked, deformed, oily or burnished)	37-45
	Front brake disc (unevenly worn)	37-33
	Rear brake disc (unevenly worn)	37-45
	Vacuum booster pushrod position (incorrect)	37-26
	Vacuum leaks in booster system	37-21
Hard pedal (firm-depress unable to lock-up wheels)	Vacuum booster (bounce)	37-21
Pedal overtravel (vehicle stops normally)	Air in brake system	37-12
Pedal pulsates/bounces during braking	Brake disc (unevenly worn)	37-33 37-45

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Symptom	Suspected Area	See page
Low or spongy pedal	Air in brake system	37-12
	Brake system (leaked)	-
	Front brake piston seal (worn or damaged)	37-33
	Rear brake piston seal (worn or damaged)	37-44
	Brake master cylinder assembly (malfunctioning)	37-18
	Vacuum booster pushrod position (incorrect)	37-26
Vehicle pulls during braking	Front brake piston (stuck or frozen)	37-33
	Rear brake piston (stuck or frozen)	37-44
	Front brake lining (dirty, cracked or deformed)	37-33
	Rear brake lining (dirty, cracked or deformed)	37-45
	Front brake disc (unevenly worn)	37-33
	Rear brake disc (unevenly worn)	37-45
Brake stuck	Brake pedal free play (minimum)	37-26
	Parking brake lever travel (in need of adjustment)	38-8
	Parking brake cable (stuck)	38-13
	Parking brake shoe clearance (in need of adjustment)	38-8
	Front brake lining (cracked or deformed)	37-33
	Rear brake lining (cracked or deformed)	37-45
	Front brake piston (stuck or frozen)	37-33
	Rear brake piston (stuck or frozen)	37-44
	Brake shoe return tension spring (loose or damaged)	38-17
	Vacuum booster pushrod position (incorrect)	37-26
	Vacuum leaks in booster system	37-21
	Brake master cylinder assembly (malfunctioning)	37-18

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Inspection

CAUTION

- Use well-sealed brake fluid DOT4 or equivalent. DO NOT use oily solution, otherwise brake system seal may be damaged.
- Brake fluid may damage paint surface. If brake fluid spills on paint surface, wash it off immediately with water.
- DO NOT use gasoline, kerosene, alcohol, engine oil, transmission oil or any other fluid that contains mineral oil to clean the system components. These kinds of fluid will damage rubber cover and seal.
- During servicing, make sure to clean grease or other foreign matter on the outer surface of brake caliper assembly, brake lining, brake disc and wheel hub.
- When operating brake disc and brake caliper, be careful to prevent damaging brake disc and brake caliper or scratching or cutting brake shoe linings.

1. Check conditions of tires and wheels. Damaged or worn wheels and tires can cause a pull, shudder, vibration and a condition similar to sudden braking.
2. If noise occurs while braking, check suspension components. Bounce vehicle up and down several times and check suspension or steering components for any looseness, wear or damage.
3. Check brake fluid level and condition.
   a. If brake fluid level is low, check ABS control unit assembly, brake wheel cylinder, brake caliper, brake line, brake master cylinder assembly and brake fluid reservoir, etc. for leakage.
   b. If brake fluid is contaminated, drain an amount of fluid to check. Replace with new fluid as necessary.

HINT:
It is normal that brake fluid will become dark after being used for a period of time. Do not mistake this for contamination.

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ON-VEHICLE SERVICE

Brake Bleeding

Perform brake bleeding and clutch bleeding after replacing brake and clutch related hydraulic parts. For details about clutch bleeding, See page 30-10. There are two methods for brake bleeding, specific operation procedures are as follows:

Method 1: Perform manual bleeding for brake

⚠ WARNING

- When bleeding brake system, wear safety glasses.
- Be careful when bleeding air, as brake fluid at high pressure may spray out of bleeder plug.

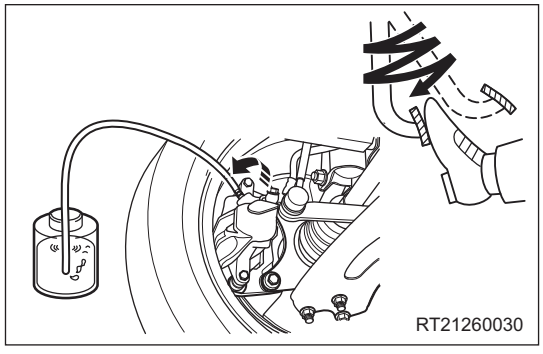
CAUTION

- Before removing brake fluid reservoir, wipe it off to prevent dust and other foreign matter from dropping into the brake fluid reservoir.
- Use fresh, clear and well-sealed brake fluid of specified type or equivalent.
- DO NOT allow brake fluid to adhere to any paint surface, such as vehicle body. If brake fluid leaks onto any paint surface, immediately wash it off.
- During bleeding, do not depress brake pedal repeatedly at any time with bleeder plug opened. Otherwise, the amount of air in system will increase, and further bleeding is needed.
- DO NOT drain brake fluid in brake fluid reservoir while bleeding brake system.

HINT:

An assistant will be required to assist when bleeding brake system.

1. Fill the brake fluid reservoir with brake fluid to proper level.
2. Loosen the bleeder plug cap and connect a clear plastic hose to the bleeder plug. Submerge the end of hose into the clear container filled with new brake fluid.
3. Have an assistant depress the brake pedal 3 to 4 times repeatedly; depress and hold the brake pedal to a lower position. Then loosen the bleeder plug, and rotate it at least one turn.



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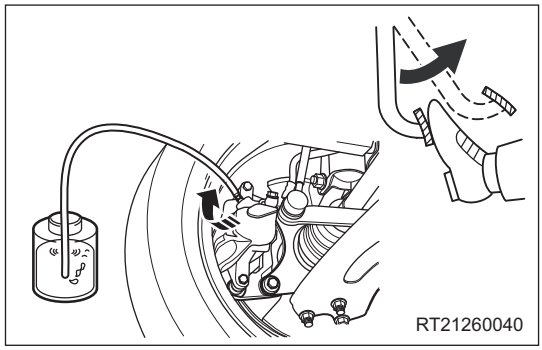
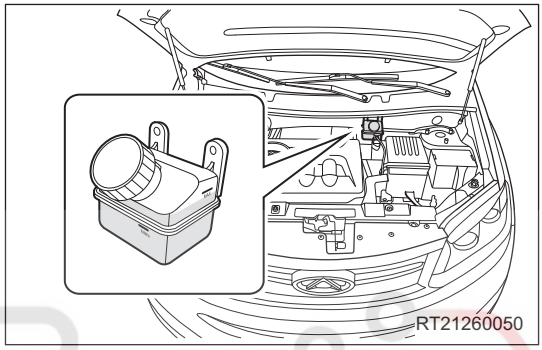
4. Tighten the bleeder plug every time the brake pedal moves down quickly. Then release the brake pedal.



5. Repeat above steps, and bleed the brake lines of each wheel in the same manner in the order of rear left wheel, front right wheel, rear right wheel and front left wheel, until all air are bled from the brake lines.

   Empty sign: a stream of fresh brake fluid flows into the clear container without bubbles.

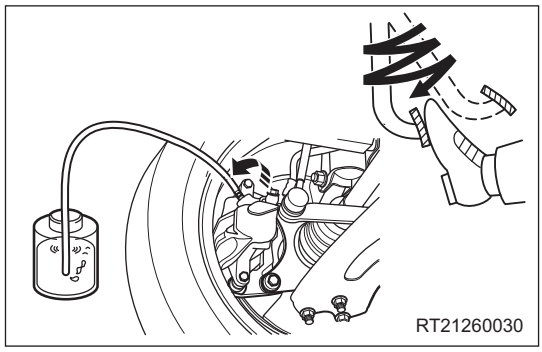
   HINT:
   During bleeding the brake system, make sure the brake fluid level is always near the "MAX" mark. Check the brake fluid level at all times during bleeding. Add brake fluid as necessary.



6. Check and adjust the brake fluid level to the "MAX" mark.
7. Check brake pedal effect. If braking effect is improper or the pedal is spongy, air may still exist in the system. Perform bleeding procedures again for brake system as necessary.
8. Have the vehicle tested to confirm that brake operates properly and pedal feel is correct.

Brake Fluid Replacement

1. Drain the brake fluid.
   a. Start the engine and run it at idle.
   b. Remove the filler cap of brake fluid reservoir assembly. Remove the bleeder plug cap and connect a clear plastic hose to the bleeder plug, and submerge the end of hose into the clear container filled with new brake fluid.
   c. Loosen the bleeder plug, and depress the brake pedal continuously until the brake fluid stops coming out.



2. Add brake fluid.
   a. Tighten the bleeder plug after confirming that brake fluid is drained. Fill the brake fluid reservoir with new brake fluid to the proper level.

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3. Perform bleeding procedures.
   a. After replacing with new brake fluid, make sure to bleed the brake system for normal operation. See page 37-12 for detail information about brake bleeding.

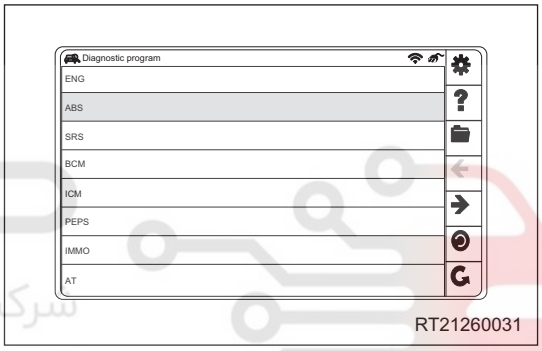
Method 2: Perform bleeding for brake using diagnostic tester

CAUTION

- Check battery voltage, and it should not be less than 10 V.
- Bleeding order must be: rear left/front left/front right/rear right. If some stage or whole bleeding process needs to be repeated, wait for 5 minutes to cool down the solenoid valve, or solenoid valve may be damaged due to overheat.

In order to reach enough pressure in hydraulic regulator, it is necessary to depress brake pedal repeatedly during the whole process.

1. Fill brake fluid reservoir with brake fluid to a proper level.
2. Depress brake pedal for more than 20 times with engine stopped.
3. Turn ignition switch to ON, use X-431 3G diagnostic tester (the latest software) to enter T21 "ABS" system.
   - Please select [ABS] on Diagnostic program screen.



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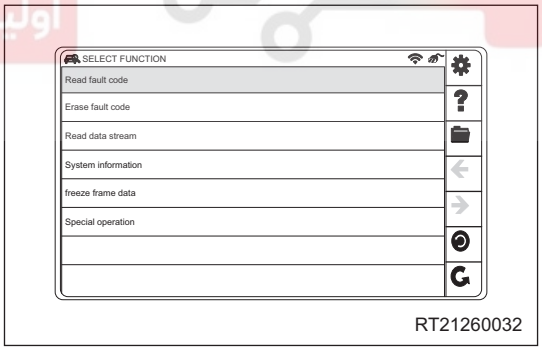
   - Please select [Special operation] on SELECT FUNCTION screen.



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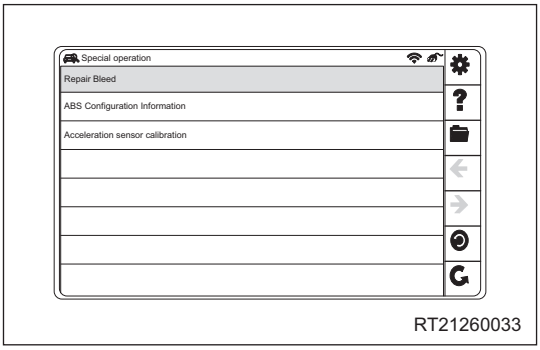
   - Please select [Repair Bleed] on Special operation screen.



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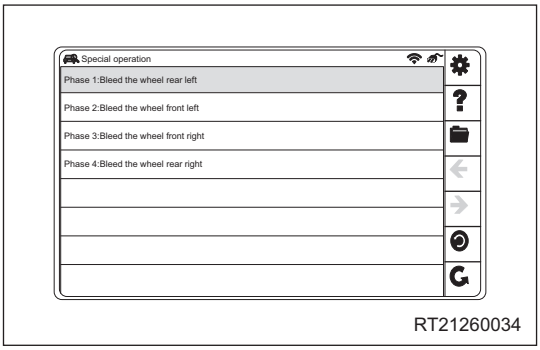
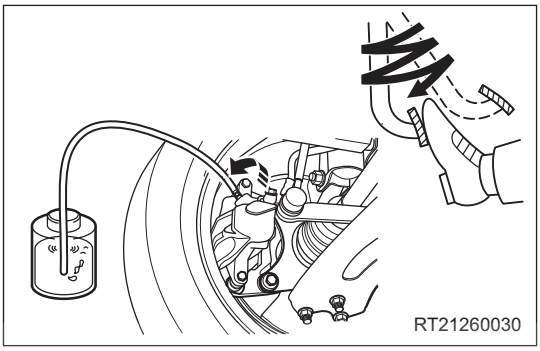
- Please select [phase 1: Bleed the wheel rear left] on Special operation screen to perform bleeding for rear left wheel.



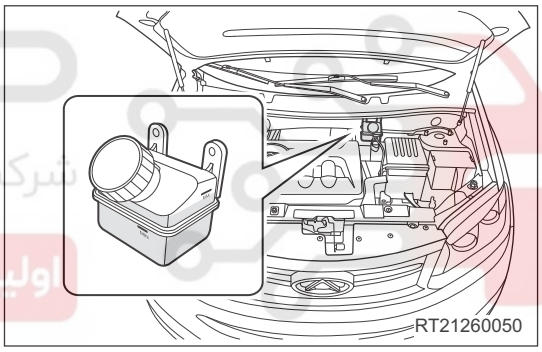
4. Loosen the left rear wheel bleeder plug cap and connect a clear plastic hose to bleeder plug. Submerge the end of hose into clear container filled with new brake fluid.



5. Perform bleeding for brake lines of front left wheel, front right wheel and rear right wheel according to bleeding procedures of rear left wheel above, until air in brake system is bled.

   Empty sign: a stream of fresh brake fluid flows into the clear container without bubbles.

   HINT:
   During bleeding brake system, make sure brake fluid level in brake fluid reservoir is always near "MAX" mark. Check the brake fluid level at all times during bleeding. Add brake fluid as necessary.



6. Check and adjust brake fluid level to "MAX" mark.
7. Check the brake pedal effect. If braking effect is poor or pedal is spongy, air may still exist in system. Perform bleeding procedures for brake system again as necessary.
8. Test vehicle to confirm that brakes operate properly with good depressing feel.

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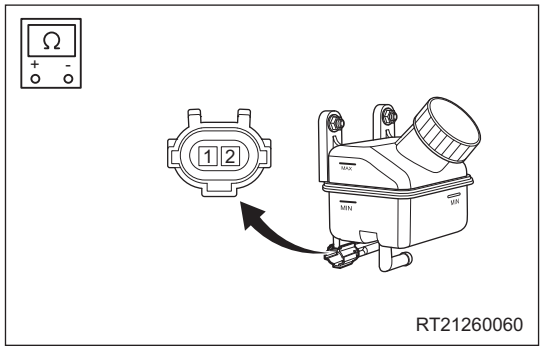
Brake Fluid Reservoir Assembly

On-vehicle Inspection

1. Check the brake fluid level warning switch.
   a. Remove the brake fluid reservoir filler cap.
   b. Disconnect the brake fluid level warning switch wire harness connector.
   c. Using ohm band of digital multimeter, check for continuity between brake fluid level warning switch terminals according to conditions shown in the table below.



Standard Condition

Multimeter Connection	Condition	Specified Condition
Terminal 1 - Terminal 2	Float upward (switch ON)	No continuity
Terminal 1 - Terminal 2	Float downward (switch OFF)	Continuity

HINT:

- There is a float in the fluid reservoir. The position of float changes according to increasing or decreasing brake fluid level.
- If result is not as specified, replace brake fluid reservoir assembly.

   d. Add brake fluid to the "MAX" mark.

Removal

1. Drain the brake fluid (See page 37-13).

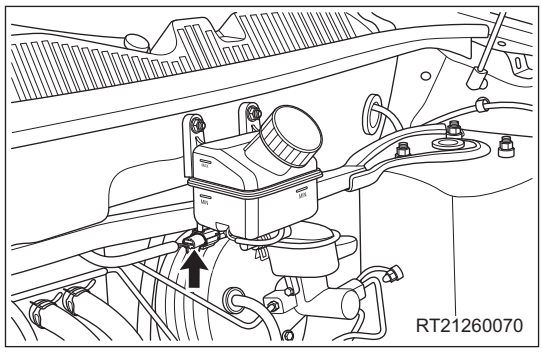
ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

2. Remove the brake fluid reservoir assembly.
   a. Disconnect the brake fluid level warning switch connector (arrow).



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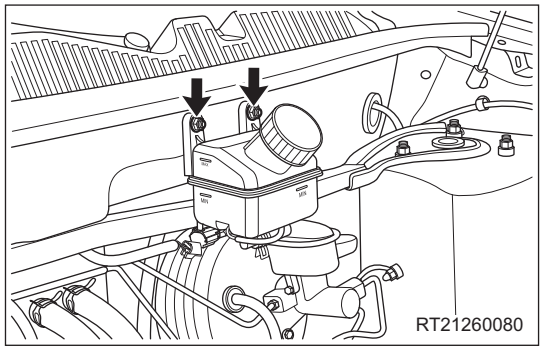
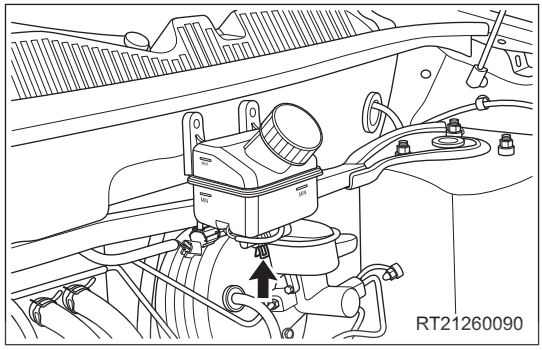
b. Remove the coupling nuts (arrow) between brake fluid reservoir assembly and body.
(Tightening torque: 9 ± 1 N·m)



c. Loosen the brake fluid tube fixing clamp (arrow) and disengage the brake fluid tube from brake fluid reservoir assembly.



d. Remove the brake fluid reservoir assembly.

Installation

Installation is in the reverse order of removal.

HINT:
Perform bleeding procedures for brake system and add brake fluid to the proper level after completing installation.

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Brake Master Cylinder Assembly

Removal

CAUTION

- Remove the vacuum remained in vacuum booster before removing brake master cylinder assembly to avoid damaging brake master cylinder assembly and prevent booster from sucking in any pollutant.
- When engine is not running, remove vacuum by depressing brake pedal repeatedly until the brake pedal can be depressed firmly.
- When removing brake line, sealing measures should be taken to prevent foreign matter from entering.

1. Drain the brake fluid (See page 37-13).

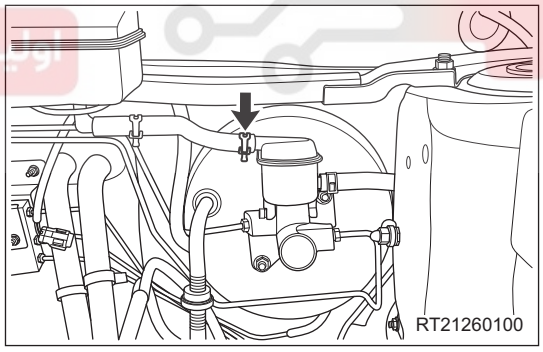
CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

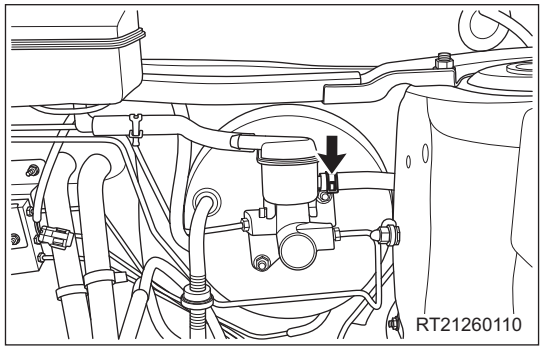
ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

2. Remove the air filter assembly (See page 15-13).
3. Remove the brake master cylinder assembly.
   a. Loosen the brake fluid tube fixing clamp (arrow) and disengage the brake fluid tube from brake fluid reservoir assembly.



   b. Loosen the clutch hose fixing clamp (arrow) and disengage the clutch hose from brake fluid reservoir assembly (for only MT model).



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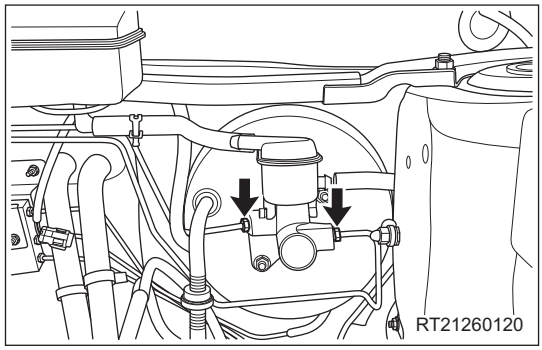
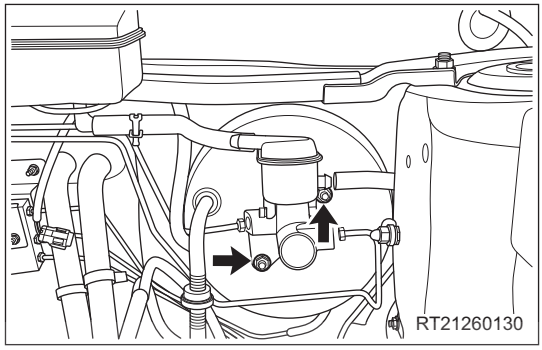
c. Loosen 2 coupling plugs (arrow) between brake master cylinder assembly and brake pipes.
(Tightening torque: 16 ± 2 N·m)

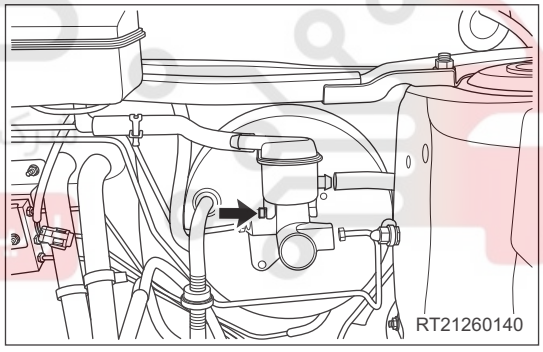


d. Loosen 2 coupling nuts (arrow) between brake master cylinder assembly and vacuum booster.
(Tightening torque: 21 - 25 N·m)

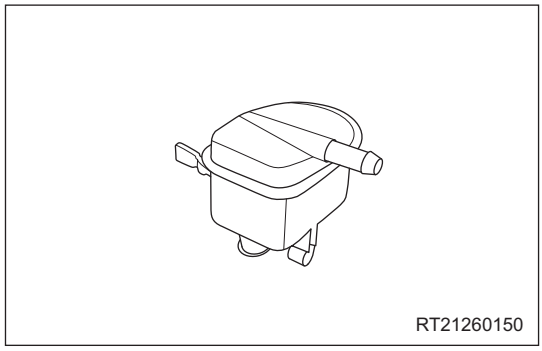


e. Carefully and vertically slide the brake master cylinder assembly out of vacuum booster.

f. Remove the coupling bolt (arrow) between brake fluid reservoir assembly and brake master cylinder assembly.
(Tightening torque: 3 - 5 N·m)



g. Disengage the connection between brake fluid reservoir assembly and brake master cylinder assembly, and remove the brake fluid reservoir assembly.



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CAUTION

- Brake master cylinder assembly and piston are designed to make piston fall out easily. To prevent this, make sure brake master cylinder is horizontal or end surface downward (piston surface facing upward) when handling the brake master cylinder assembly.
- Make sure that no foreign matter adheres to brake master cylinder assembly piston. If foreign matter adheres, clean it off with a piece of clean cloth. Then, apply grease to entire outer edge contact surface of master cylinder piston.
- Master cylinder should be handled carefully. Avoid any impact to the master cylinder, such as falling. The fallen master cylinder cannot be reused.
- DO NOT tap or pinch master cylinder piston, and avoid damaging master cylinder piston in any other ways.

Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure to tighten coupling plugs and nuts to the specified torque during installation.
- Perform bleeding procedures for brake system and add brake fluid to the proper level after completing installation.

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Vacuum Booster with Brake Master Cylinder Assembly

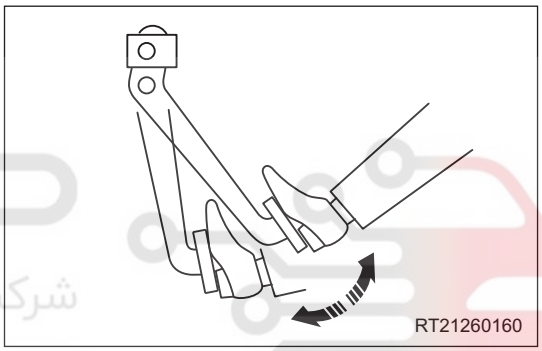
On-vehicle Inspection

1. Check vacuum booster assembly.
   a. Air tightness check.
      - Start engine and stop it after 1 or 2 minutes. Slowly depress brake pedal several times.
      - Make sure that booster is airtight. Check that distance every time the pedal depressed is gradually decreased compare to the previous operation.

        If pedal operation is not as specified, check the check valve. If check valve is normal, replace the vacuum booster assembly.
      - Start engine. Depress and hold pedal, then stop engine.
      - Make sure that booster is airtight. Depress and hold pedal for 30 seconds, and check that pedal reserve distance does not change.

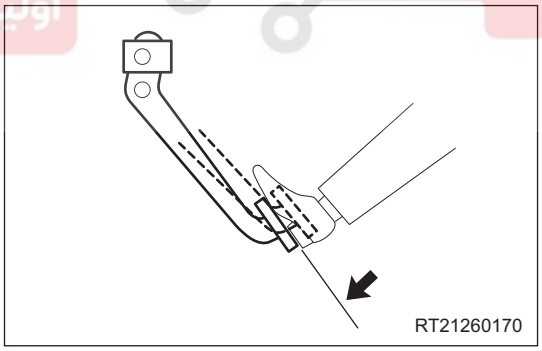
        If pedal operation is not as specified, check the check valve. If check valve is normal, replace the vacuum booster assembly.

   b. Operation check.
      - Stop engine.
      - Depress pedal several times and check that pedal reserve distance does not change.



      - Depress and hold pedal, and then start engine. Check that pedal can only be depressed lightly.

        If pedal operation is not as specified, check the check valve. If check valve is normal, replace the vacuum booster assembly.



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Removal

1. Drain the brake fluid (See page 37-13).

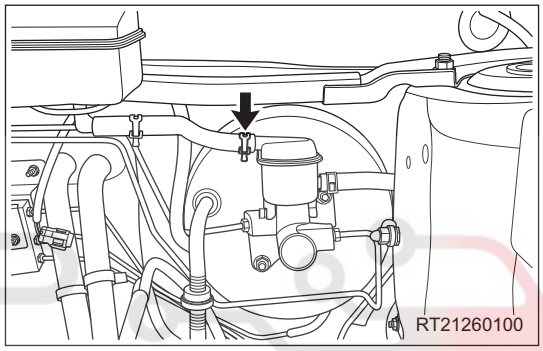
CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

2. Remove the air filter assembly (See page 15-13).
3. Remove the vacuum booster with brake master cylinder assembly.
   a. Loosen the brake fluid tube fixing clamp (arrow) and disengage the brake fluid tube from brake fluid reservoir assembly.



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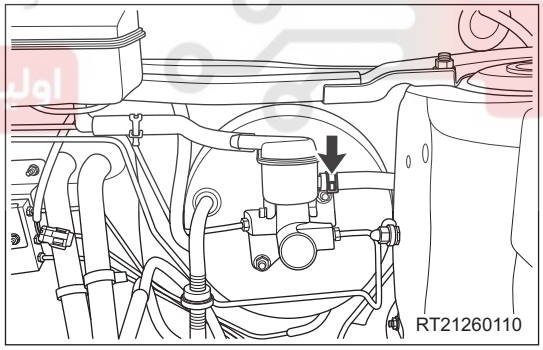
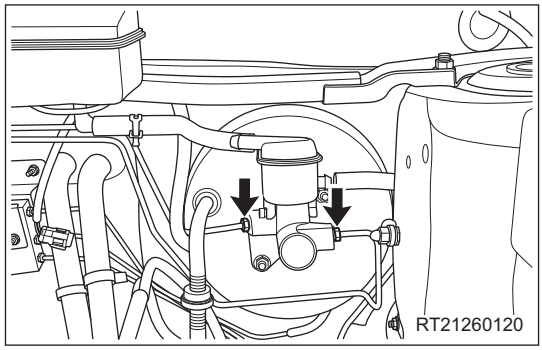
   b. Loosen the clutch hose fixing clamp (arrow) and disengage the clutch hose from brake fluid reservoir assembly (for only MT model).



   c. Loosen 2 coupling plugs (arrow) between brake master cylinder assembly and brake pipes.
   (Tightening torque: 16 ± 2 N·m)



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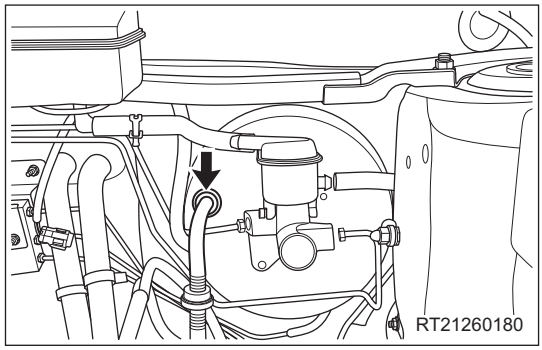
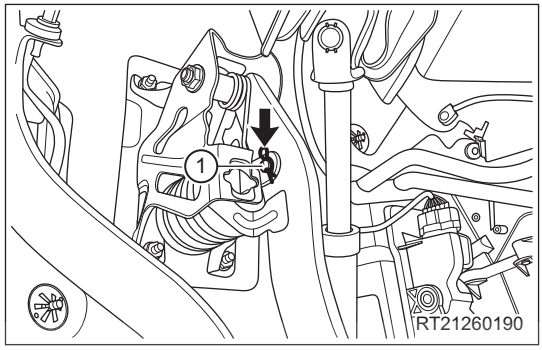
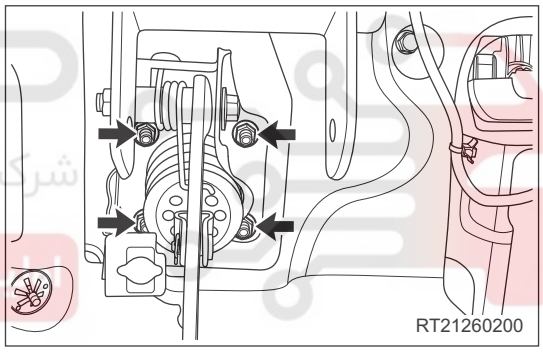
d. Disengage the vacuum hose assembly with check valve (arrow) from vacuum booster assembly.



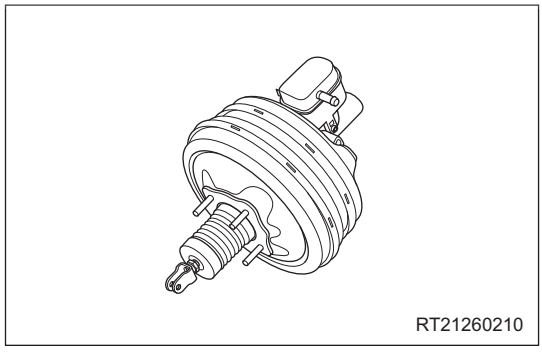
e. Using needle-nose pliers, remove the locking pin (arrow) and pushrod pin (1) from vacuum booster pushrod, and detach the brake pedal assembly.



f. Remove 4 coupling nuts (arrow) between vacuum booster assembly and brake pedal assembly. (Tightening torque: 25 ± 3 N·m)



g. Remove the vacuum booster with brake master cylinder assembly from engine compartment.



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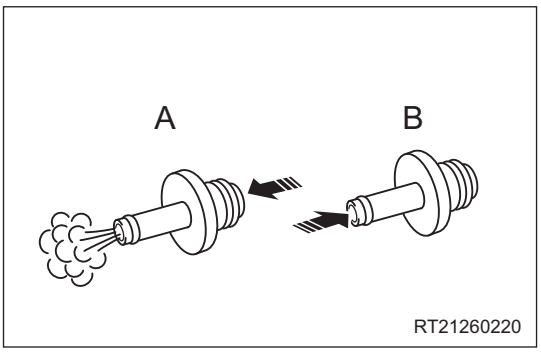
Inspection

1. Check the check valve.
   a. Remove the check valve from vacuum hose assembly.
   b. Check that there is airflow (A) from vacuum booster to engine, and no airflow (B) from engine to vacuum booster.

      If result is not as specified, replace vacuum hose assembly.



Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure to tighten fixing plugs and nuts to the specified torque during installation.
- Perform bleeding procedures for brake system and add brake fluid to proper level after completing installation.

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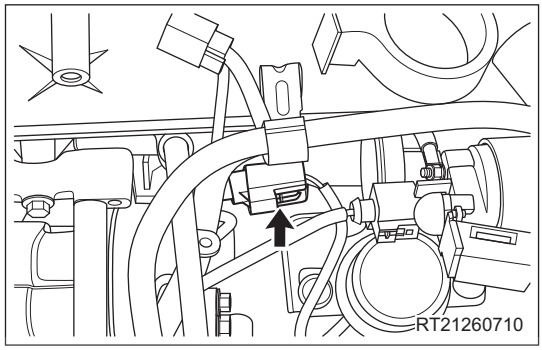
Vacuum Pump Assembly

Removal

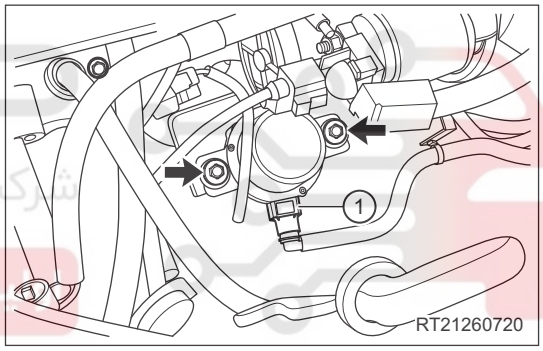
CAUTION

- Be sure to turn ignition switch off and depress brake pedal repeatedly to release the vacuum pressure.

1. Remove the vacuum pump assembly.
   a. Disconnect the vacuum booster connector (arrow).



   b. Disconnect connector (1) and detach connection between vacuum pump and vacuum pipe.
   c. Remove 2 fixing bolts (arrow) from vacuum pump.
   d. Remove the vacuum pump.



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Installation

1. Installation is in the reverse order of removal.

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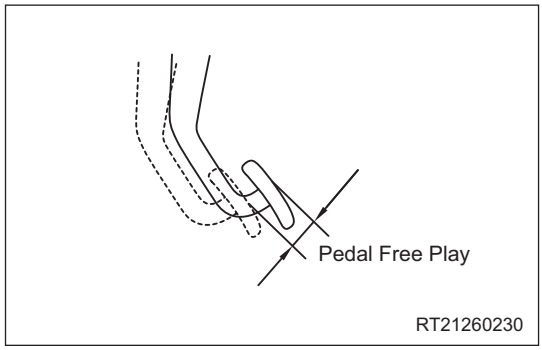
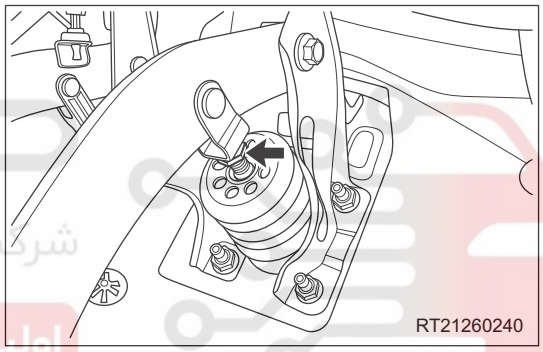
Brake Pedal Assembly

On-vehicle Inspection

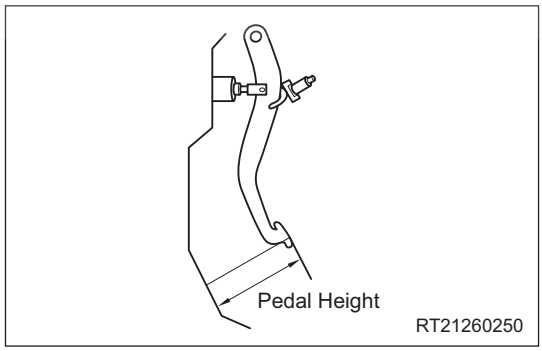
1. Check brake pedal free play.
   a. Stop engine. Depress brake pedal several times until no vacuum is left in vacuum booster, and then release brake pedal.
   b. Depress brake pedal until resistance is felt.
   c. As shown in the illustration, check the brake pedal free play by measuring distance between pedal position in above step and pedal position when it is released.
   Standard brake pedal free play: 1 - 9 mm



2. Adjust brake pedal free play.
   a. As shown in the illustration, loosen the vacuum booster pushrod locking nut (arrow) and rotate the vacuum booster pushrod clockwise or counterclockwise to adjust the brake pedal free play to the specified value.



3. Check brake pedal height.
   a. As shown in the illustration, turn over the carpet and measure distance between brake pedal center and dash panel, which is the brake pedal height.
   Standard brake pedal height: 176 - 186 mm



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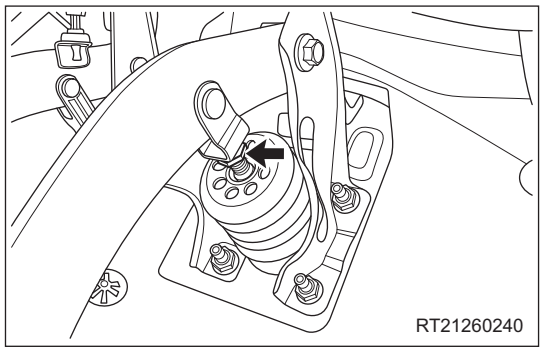
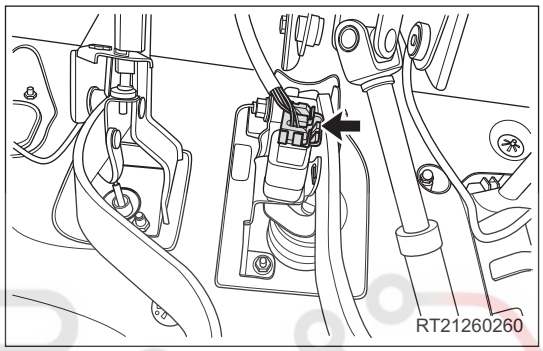
4. Adjust brake pedal height.
   a. As shown in the illustration, loosen the vacuum booster pushrod locking nut (arrow) and rotate the vacuum booster pushrod clockwise or counterclockwise to adjust brake height to the specified value.

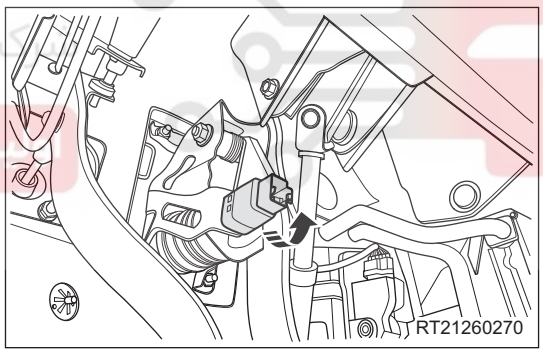


Removal

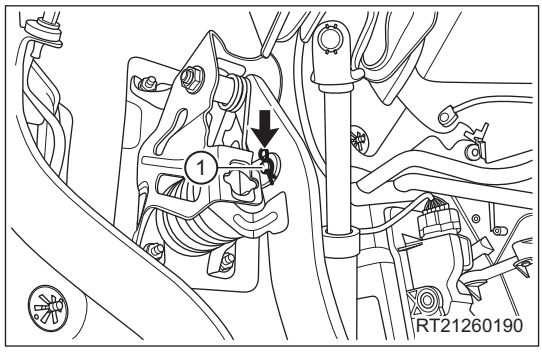
1. Remove the brake light switch assembly.
   a. Disconnect the brake light switch assembly wire harness connector (arrow).



   b. Remove the brake light switch assembly by rotating it 90° clockwise or counterclockwise.



2. Remove the brake pedal assembly.
   a. Using needle-nose pliers, remove the locking pin (arrow) and pushrod pin (1) from vacuum booster pushrod, and detach the brake pedal assembly.



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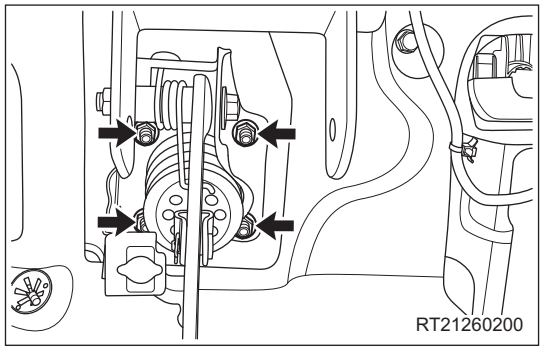
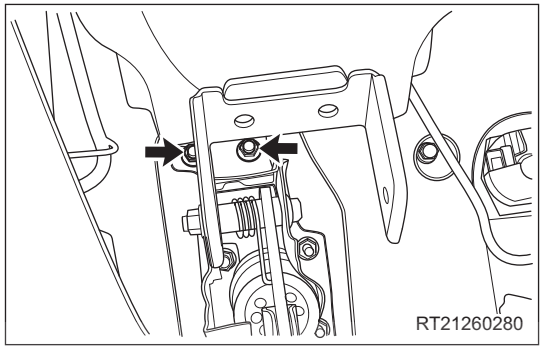
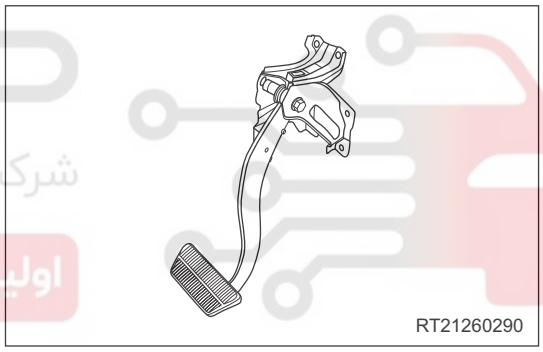
b. Remove 4 coupling nuts (arrow) between vacuum booster assembly and brake pedal assembly.
(Tightening torque: 25 ± 3 N·m)



c. Remove 2 coupling nuts (arrow) between brake pedal assembly and body.
(Tightening torque: 25 ± 3 N·m)



d. Remove the brake pedal assembly from the inside of vehicle.



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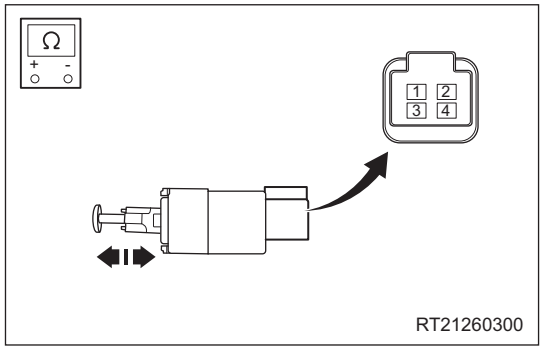
Inspection

1. Check brake light switch assembly.
   a. Using ohm band of digital multimeter, check for continuity between brake light switch assembly terminals according to the table below.

      Standard Condition



Multimeter Connection	Switch Condition	Specified Condition
Terminal 1 - Terminal 3	Brake pedal depressed (switch pin released)	Continuity
Terminal 2 - Terminal 4	Brake pedal depressed (switch pin released)	No continuity
Terminal 1 - Terminal 3	Brake pedal released (switch pin pushed)	No continuity
Terminal 2 - Terminal 4	Brake pedal released (switch pin pushed)	Continuity

   If result is not as specified, replace brake light switch assembly.

Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure to tighten fixing nuts to the specified torque during installation.
- Check that brake light operates properly after completing installation.

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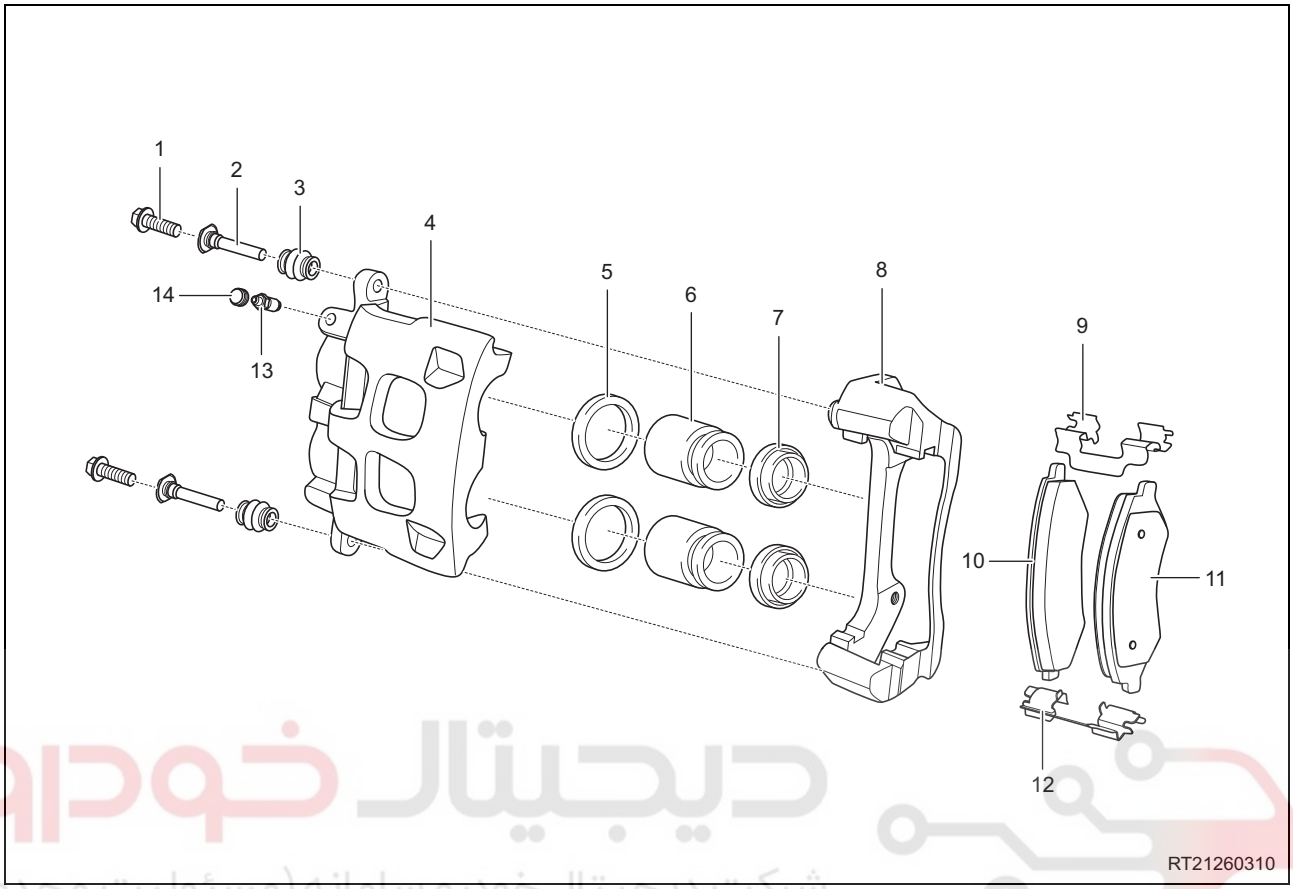
Front Disc Brake Assembly



1 - Brake Caliper Locating Bolt	2 - Brake Caliper Locating Bolt Guide Pin
3 - Brake Caliper Guide Pin Rubber Dust Boot	4 - Front Disc Brake Cylinder
5 - Front Disc Brake Piston Seal Ring	6 - Front Disc Brake Piston
7 - Front Disc Brake Piston Dust Boot	8 - Front Disc Brake Caliper Fixing Bracket
9 - Upper Support Gasket	10 - Inner Brake Lining
11 - Outer Brake Lining	12 - Lower Support Gasket
13 - Bleeder Plug	14 - Bleeder Plug Cap

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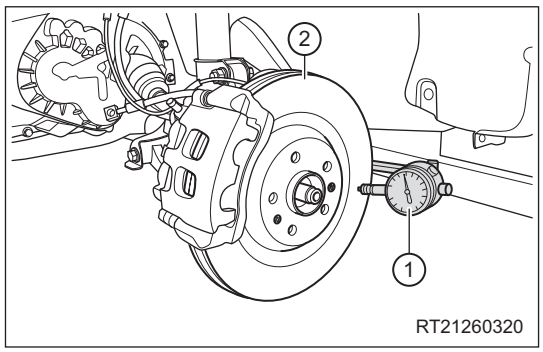
On-vehicle Inspection

1. Check brake disc runout.
   a. Remove the front wheel (See page 35-9).
   b. Secure the dial indicator (1) to the proper position. Position the dial indicator pointer approximately 10 mm from the outer edge of brake disc.
   c. Slowly rotate the brake disc (2) and check the runout. Mark the lowest and highest points and record these measurements.



   d. Check the runout on the opposite side of brake disc in the same way. Mark the lowest and highest points and record these measurements.
   e. Compare the recorded runout value and limit value.
   Maximum runout for front brake disc: 0.06 mm
   f. If runout exceeds the maximum value, replace the brake disc.

Removal

HINT:
- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

1. Drain the brake fluid (See page 37-13).

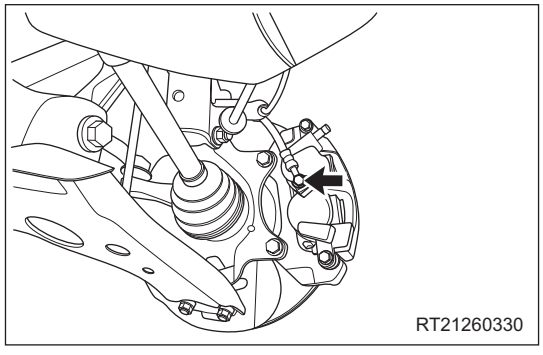
CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

2. Remove the front left wheel (See page 35-9).
3. Remove the front left brake caliper assembly.
   a. Remove the coupling bolt and washer (arrow) between front left brake caliper assembly and front left brake hose assembly.
   (Tightening torque: 27 ± 2 N·m)



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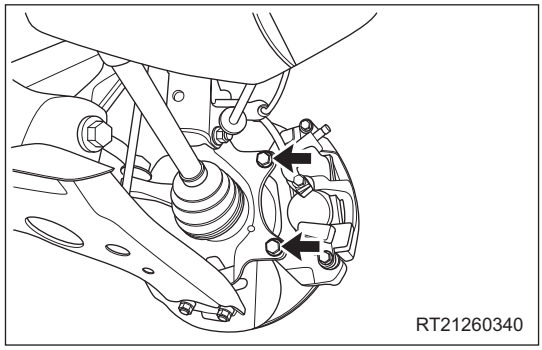
CAUTION

- DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose, as brake fluid is corrosive.

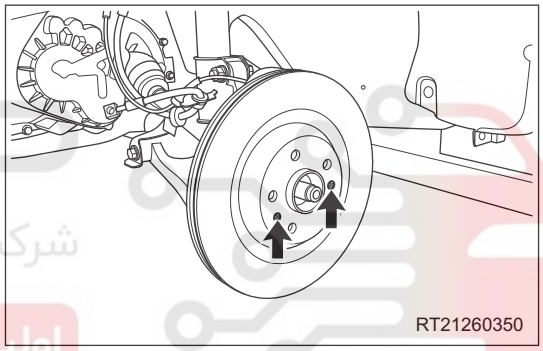
b. Remove the coupling bolts (arrow) between front left brake caliper assembly and front left steering knuckle. (Tightening torque: 100 ± 10 N·m)



c. Remove the front left brake caliper assembly.

4. Remove the front left brake disc.

a. Remove 2 positioning screws (arrow) from front left brake disc, and remove the front left brake disc. (Tightening torque: 10 ± 1 N·m)



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Disassembly

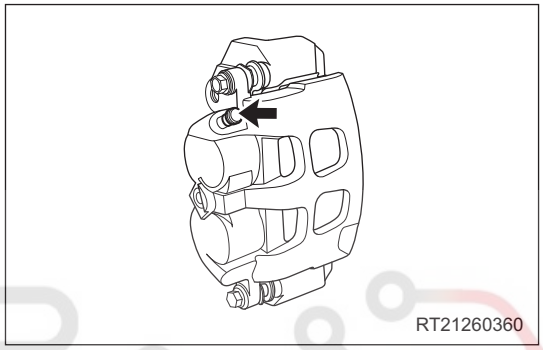
HINT:

- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

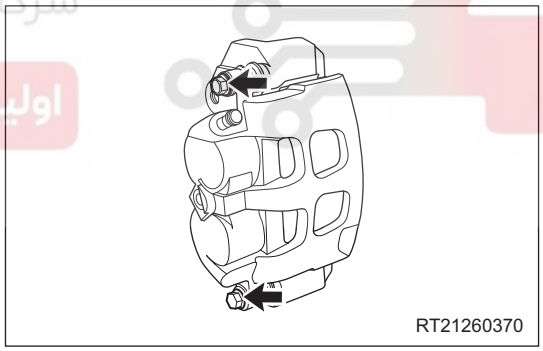
⚠ WARNING

- Never use high pressure when removing piston from the bore of brake caliper. Otherwise this may cause personal injuries.
- If it is needed to remove piston with compressed air. DO NOT face the piston to yourself or place your hands around the brake caliper and piston.

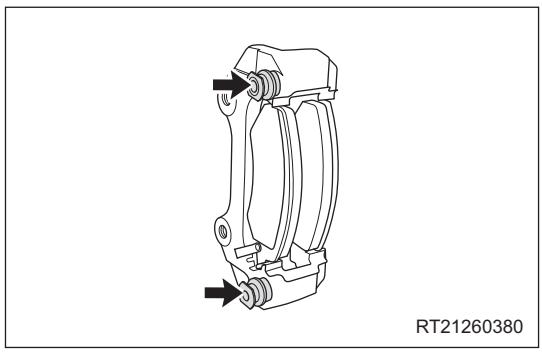
1. Remove the bleeder plug (w/ bleeder plug cap).
   a. Remove the bleeder plug (w/ bleeder plug cap) (arrow) from brake caliper assembly.


RT21260360

2. Remove the brake cylinder assembly.
   a. Remove 2 locating bolts (arrow) between brake caliper fixing bracket and brake cylinder assembly.


RT21260370

   b. Detach the brake cylinder assembly and brake caliper fixing bracket.
3. Remove the front brake caliper locating bolt guide pin (w/ dust boot).
   a. Remove 2 brake caliper locating bolt guide pins (w/ dust boot) (arrow) from brake caliper fixing bracket.


RT21260380

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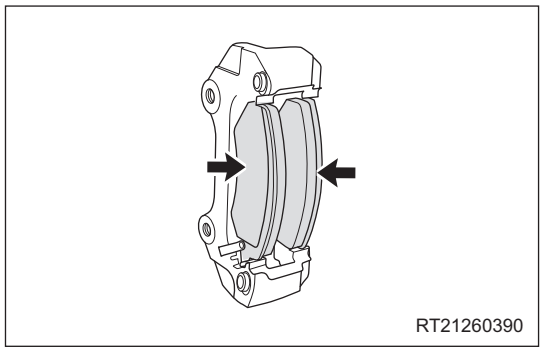
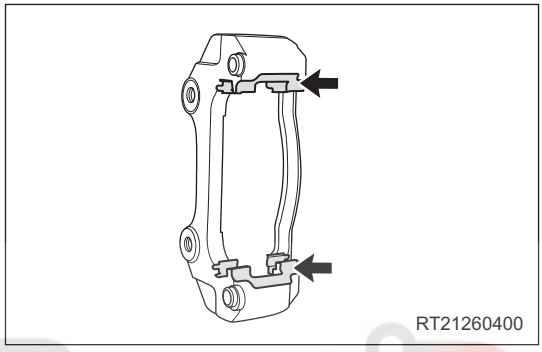
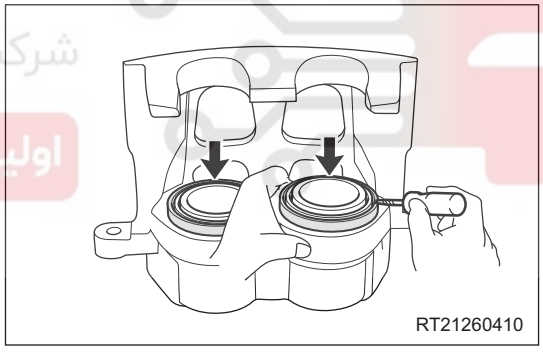
4. Remove the front brake lining.
   a. Remove the inner brake lining and outer brake lining (arrow) from brake caliper fixing bracket.


RT21260390

5. Remove the brake lining support gasket.
   a. Remove 2 brake lining support gaskets (arrow) from brake caliper fixing bracket.


RT21260400

6. Remove the brake cylinder dust boot.
   a. Using a flat tip screwdriver wrapped with protective tape, pry out the dust boots (arrow) on both sides carefully.


RT21260410

CAUTION

- Be careful not to damage brake piston and brake cylinder.

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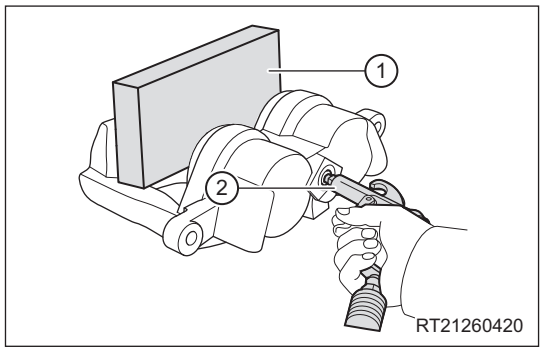
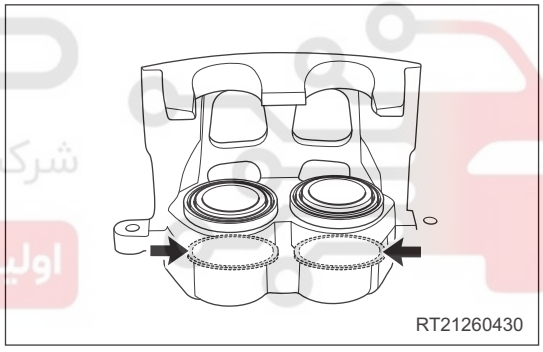
7. Remove the front disc brake piston.
   a. Place a wooden board (1) between front disc brake piston and front disc brake cylinder.
   b. Use compressed air (2) to carefully press out the piston from front disc brake cylinder through the attachment hole.



CAUTION

- Be careful not to splash brake fluid.
- DO NOT hold piston by hands to prevent injury.
- DO NOT remove or install brake piston casually, and always perform these operations by professional.

   c. Clean the piston bore with alcohol or proper solution. Then wipe it with a piece of lint.
8. Remove the front disc brake piston seal ring.
   a. Using a screwdriver wrapped with protective tape, carefully pry out the seal rings (arrow) on both sides of front disc brake piston from brake cylinder rear ring groove.



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Inspection

1. Check brake cylinder and piston.
   a. Check piston and bore for scratches or corrosion. If there are scratches or corrosion, remove them with fine sand cloth.
   b. Remove dirt on piston with a soft brass wire brush and coarse cloth. Do not clean the piston with polishing cloth or sand cloth, as this may damage its surface. If surface of piston is damaged, replace it. If piston is stuck or bore is worn or corroded, replace entire brake caliper assembly. Use polishing cloth to remove small corrosion points inside the bore.
2. Check brake caliper fixing bracket and brake caliper guide pin set.
   a. Clean the contact surface of brake caliper fixing bracket and brake lining support gasket with brake cleaner. Check for deformation, cracks, rust and foreign matter which is difficult to remove.
   b. Check brake caliper guide pin rubber dust boot for deformation, cracks, worn and foreign matter which is difficult to remove.
   c. Install brake caliper guide pin and brake caliper guide pin rubber dust boot to brake caliper fixing bracket. The brake caliper guide pin set should move smoothly without being stuck when pushing it with hand; otherwise replace it.
   d. After installing the brake lining, check if it is easy to fall out (due to insufficient elasticity of support gasket). Replace as necessary.

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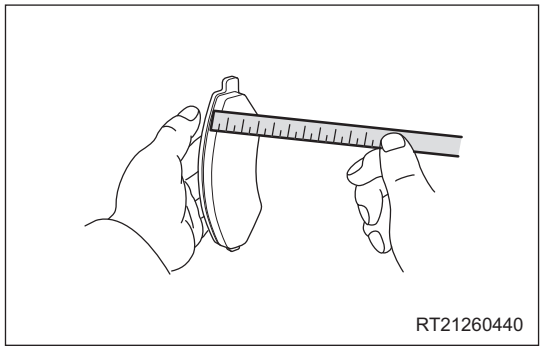
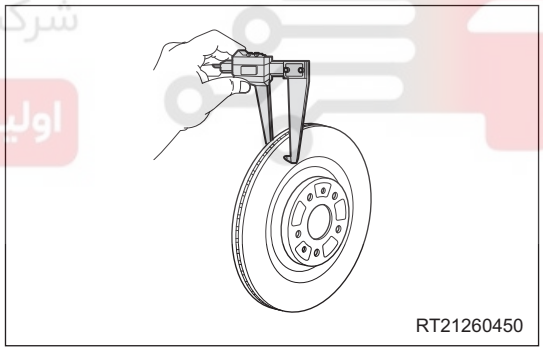
3. Check brake lining.
   a. Visually check brake lining for flatness, and also check for excessive wear. If condition of lining cannot be confirmed accurately only by visual inspection, a physical check will be used as necessary.
   b. Measure the minimum brake lining thickness. When the minimum thickness of brake lining is 2 mm or less, replace the brake lining.


RT21260440

   c. When replacing excessively worn brake linings (inner and outer), it is also necessary to replace linings on the opposite side of vehicle as well as unchecked linings to maintain proper braking performance. If it is unnecessary to replace brake linings, be sure to reinstall brake linings to the original positions.
4. Check brake disc.
   a. Minor scratch or wear on brake disc surface is acceptable. If severe scratch or deformation exists, the brake disc must be replaced.
   b. Excessive wear of brake disc may cause poor contact between brake lining and surface of brake disc. If protrusion on the disc is not removed before installing new brake lining, abnormal wear of brake disc will be caused.
   c. It is normal that the surface of brake disc is worn when replacing brake lining. If cracks or burned spots exist, the brake disc must be replaced.
5. Check brake disc thickness.
   a. Using a vernier caliper, measure the brake disc thickness at the center of brake lining contact surface as shown in the illustration.
   Standard thickness: 25 mm
   Minimum thickness: 23 mm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   b. If it is less than the minimum thickness due to wear of brake disc, replace brake disc.

CAUTION

- DO NOT machine brake disc, because it may make the brake disc thickness less than the minimum thickness.

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Assembly

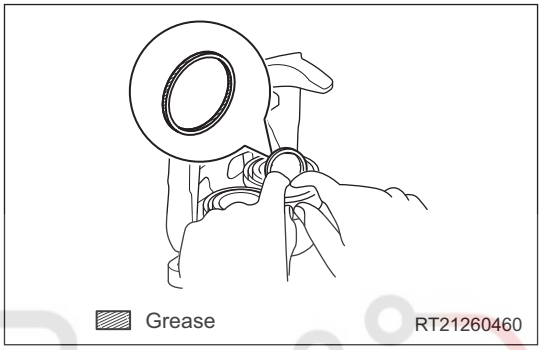
HINT:

- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

CAUTION

- When assembling brake caliper assembly, always keep your hands clean.
- When assembling brake caliper assembly, always use clean new brake fluid.
- Never use old seal ring for front disc brake piston.

1. Install the front disc brake piston seal ring.
   a. Apply a light coat of grease to entire inner and outer circumferences of new front disc brake piston seal ring.
   b. Install the front disc brake piston seal ring onto the brake cylinder.



CAUTION

- Securely install front disc brake piston seal ring into the rear ring groove of brake cylinder.

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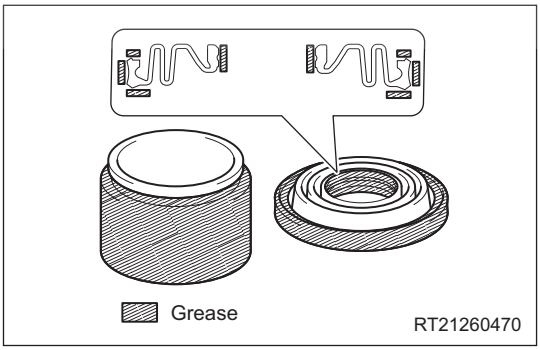
2. Install the front disc brake piston.
   a. Apply a light coat of grease to the inner and outer circumferences, and entire periphery of outer flange top/bottom surfaces of new brake cylinder dust boot as shown in the illustration.
   b. Apply a light coat of grease to the entire outer circumference (part contacting with the brake cylinder dust boot and front disc brake cylinder) of front disc brake piston.



   c. Install the brake cylinder dust boot onto the front disc brake piston.
3. Install the brake cylinder dust boot.
   a. Install the front disc brake piston to the front disc brake cylinder.

CAUTION

- DO NOT install piston forcibly to brake cylinder.

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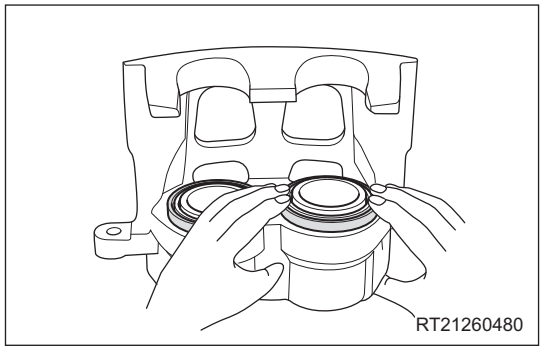
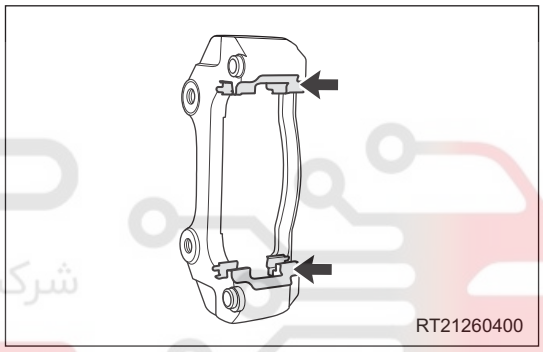
b. Install the brake cylinder dust boot to the brake cylinder.



CAUTION

- Securely install brake cylinder dust boots into front ring grooves (both sides) of disc brake cylinder.
- DO NOT damage brake cylinder dust boot.

4. Install the brake lining support gasket.
   a. Securely install the upper and lower support gaskets (arrow) onto the brake caliper fixing bracket.



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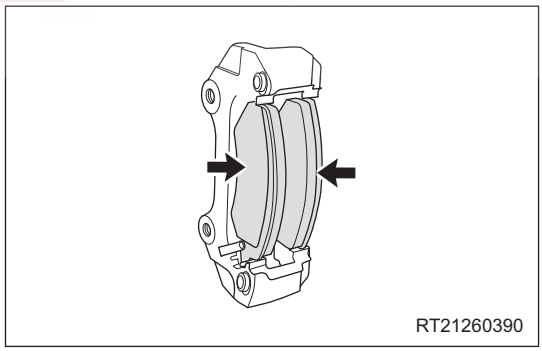
5. Install the front brake lining.
   a. Securely install the inner brake lining and outer brake lining (arrow) onto the brake caliper fixing bracket. Make sure they are clamped in place.



CAUTION

- Make sure the contact surface of lining and brake disc is free of oil and grease.

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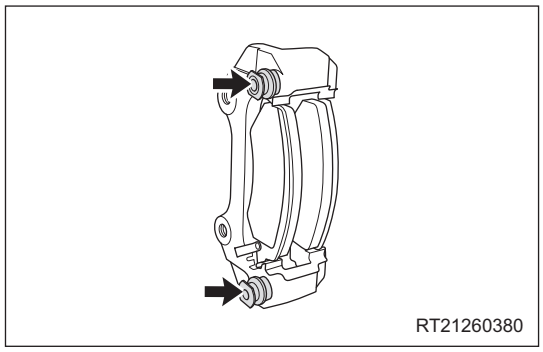
6. Install the front brake caliper locating bolt guide pin (w/ dust boot).
   a. Apply a small amount of grease to the contact surface between locating bolt guide pins and guide pin rubber dust boots, and securely install the dust boots (arrow) to the brake caliper fixing bracket.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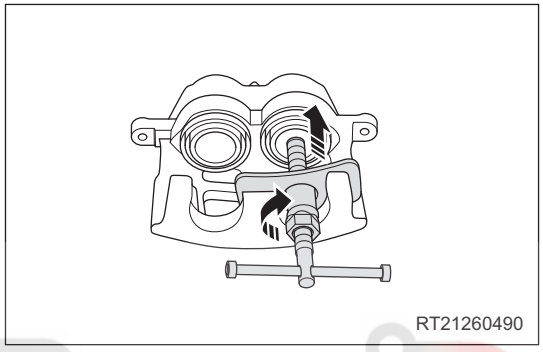
7. Install the brake cylinder assembly.
   a. Using brake cylinder piston pressing tool, slightly retract the brake cylinder piston (both sides).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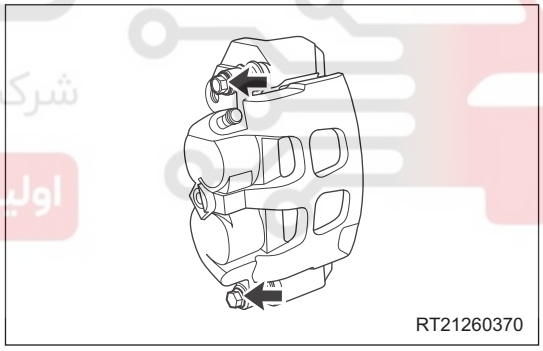
   b. Align the brake caliper locating bolts (arrow) with the guide pin hole and securely install the brake cylinder assembly.
   (Tightening torque: 25 ± 3 N·m)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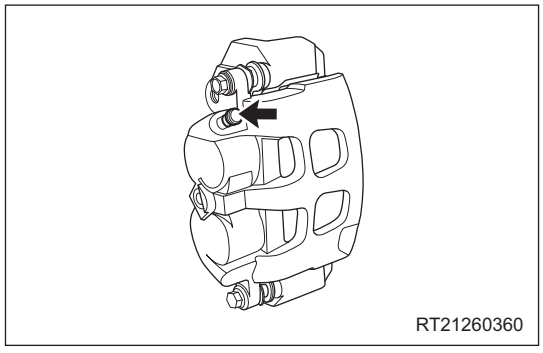
8. Install the bleeder plug (w/ bleeder plug cap).
   a. Securely install the bleeder plug (w/ bleeder plug cap) (arrow) to the front brake caliper assembly.
   (Tightening torque: 9 - 11 N·m)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Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure to tighten fixing bolts and nuts to the specified torque during installation.
- Before installing brake linings, completely retract brake caliper piston back into the bore of brake caliper.
- Depress brake pedal several times to secure the brake linings to brake disc in order to ensure safety after installing the brake linings and before moving vehicle.
- Replace brake linings in pairs. DO NOT replace it alone.
- DO NOT install inner brake lining and outer brake lining reversely.
- Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.
- Be sure to perform bleeding procedures for brake system after installation.
- Be sure to add brake fluid to the proper level after installation.

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Front Brake Hose Assembly

Removal

CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

HINT:
- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

1. Remove the front left wheel (See page 35-9).
2. Drain the brake fluid (See page 37-13).

CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

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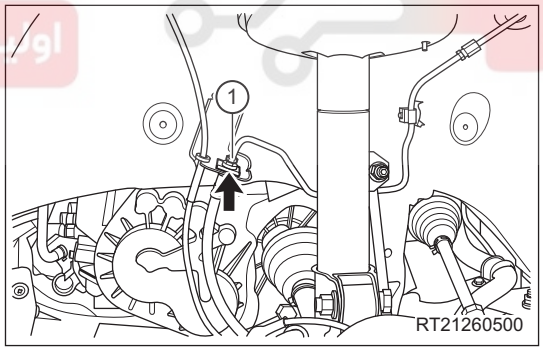
3. Remove the front left brake hose assembly.
   a. Disengage the fixing clamp (arrow) and loosen the coupling plug (1) between front left brake hose assembly and front left brake pipe.
   (Tightening torque: 16 ± 2 N·m)



CAUTION

- DO NOT bend or damage brake tube.
- DO NOT allow any foreign matter such as dirt and dust to enter brake tube from joint parts.
- After removing brake line, perform sealing treatment to prevent foreign matter from entering.

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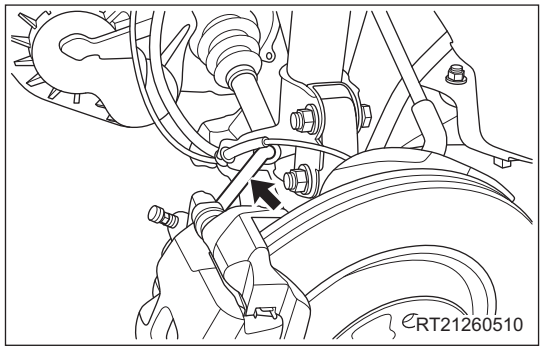
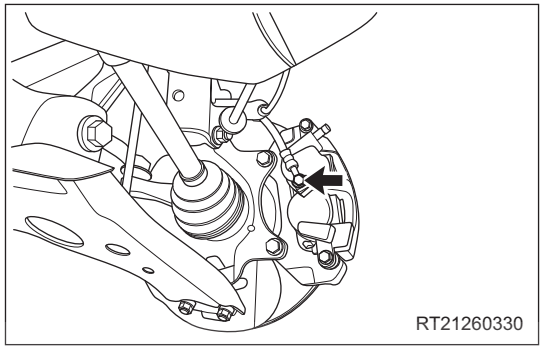
b. Remove the front left brake hose assembly (arrow) from front left shock absorber assembly.



c. Remove the coupling bolt and washer (arrow) between front left brake caliper assembly and front left brake hose assembly.
(Tightening torque: 27 ± 2 N·m)



CAUTION

- DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose, as the brake fluid is corrosive.

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d. Remove the front left brake hose assembly.

Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure to tighten coupling bolts and plug to the specified torque during installation.
- Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.
- Be sure to perform bleeding procedures for brake system after installation.
- Be sure to add brake fluid to the proper level after installation.

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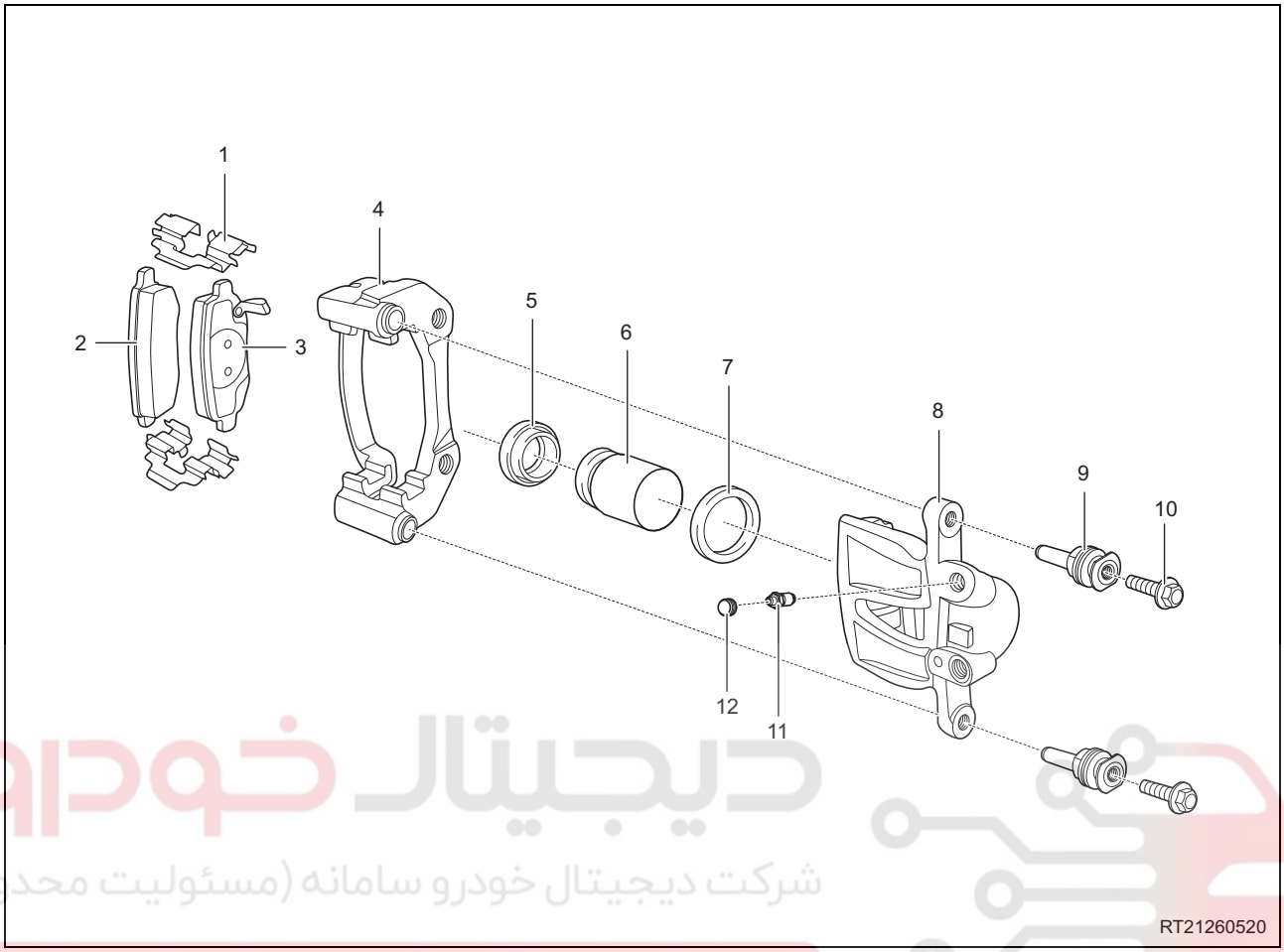
Rear Disc Brake Assembly



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1 - Support Gasket	2 - Outer Brake Lining
3 - Inner Brake Lining	4 - Rear Disc Brake Caliper Fixing Bracket
5 - Rear Disc Brake Piston Dust Boot	6 - Rear Disc Brake Piston
7 - Rear Disc Brake Piston Seal Ring	8 - Rear Brake Cylinder
9 - Brake Caliper Locating Bolt Guide Pin (w/ Dust Boot)	10 - Brake Caliper Locating Bolt
11 - Bleeder Plug	12 - Bleeder Plug Cap

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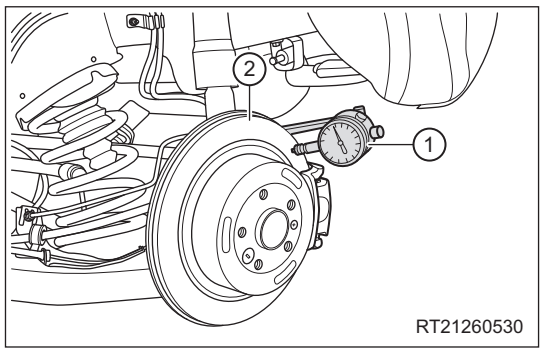
On-vehicle Inspection

1. Check brake disc runout.
   a. Remove the rear wheel (See page 35-9).
   b. Secure the dial indicator (1) to the proper position. Position the dial indicator pointer approximately 10 mm from the outer edge of rear brake disc.
   c. Slowly rotate the brake disc (2) and check the runout. Mark the lowest and highest points and record these measurements.



   d. Check the runout on the opposite side of brake disc in the same way. Mark the lowest and highest points and record these measurements.
   e. Compare the recorded runout value and limit value.
   Maximum runout for front brake disc: 0.06 mm
   f. If the runout exceeds the maximum value, replace the brake disc.

Removal

HINT:

- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

1. Drain the brake fluid (See page 37-13).

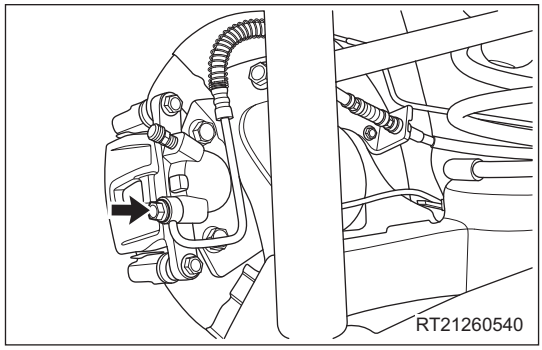
CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

2. Remove the rear left wheel (See page 35-9).
3. Remove the rear left brake caliper assembly.
   a. Remove the coupling bolt and washer (arrow) between rear left brake caliper assembly and rear left brake hose assembly.
   (Tightening torque: 20 ± 2 N·m)



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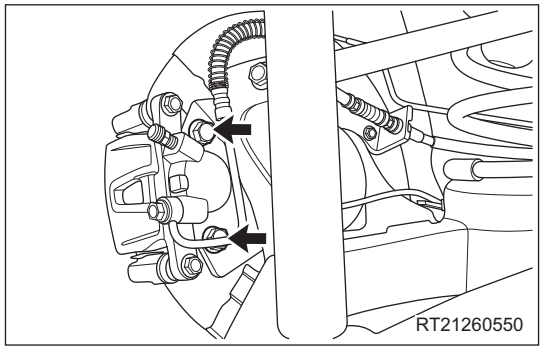
CAUTION

- DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose, as the brake fluid is corrosive.

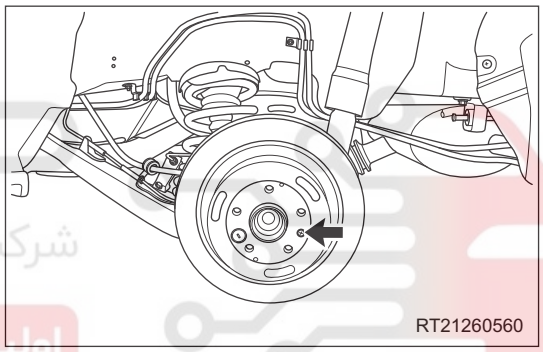
b. Remove the coupling bolts (arrow) between rear left brake caliper assembly and rear left brake bottom board assembly.
(Tightening torque: 100 ± 10 N·m)



c. Remove the rear left brake caliper assembly.

4. Remove the rear left brake disc.

a. Remove the positioning screw (arrow) from rear left brake disc, and remove the rear left brake disc.
(Tightening torque: 10 ± 1 N·m)



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Disassembly

HINT:

- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

WARNING

- Never use high pressure when removing piston from the bore of brake caliper. Otherwise this may cause personal injuries.
- If it is needed to remove piston with compressed air. DO NOT allow the piston to face yourself or place your hands around the brake caliper and piston.

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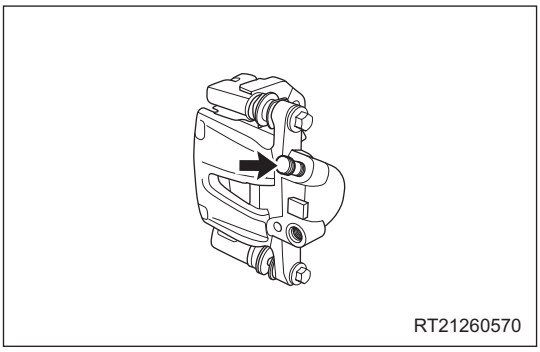
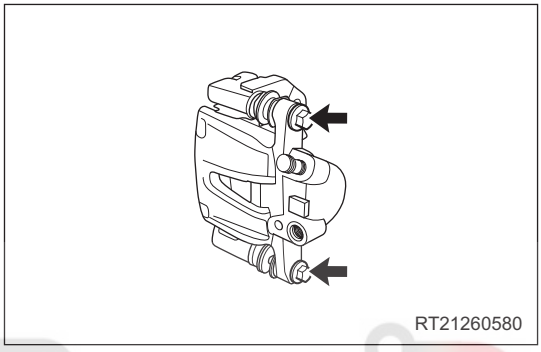
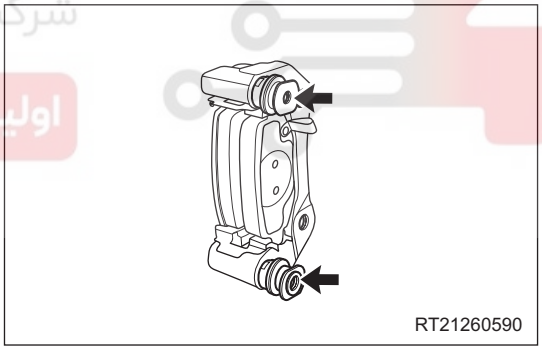
1. Remove the bleeder plug (w/ bleeder plug cap).
   a. Remove the bleeder plug (w/ bleeder plug cap) (arrow) from brake caliper assembly.



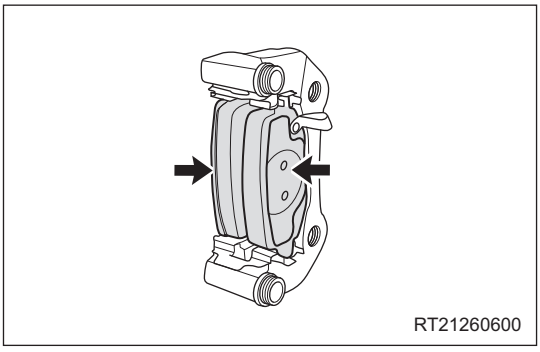
2. Remove the brake cylinder assembly.
   a. Remove 2 locating bolts (arrow) between brake caliper fixing bracket and brake cylinder assembly.



   b. Detach the brake cylinder assembly and brake caliper fixing bracket.
3. Remove the rear brake caliper locating bolt guide pin (w/ dust boot).
   a. Remove 2 brake caliper locating bolt guide pins (w/ dust boot) (arrow) from brake caliper fixing bracket.



4. Remove the rear brake lining.
   a. Remove the inner brake lining and outer brake lining (arrow) from brake caliper fixing bracket.



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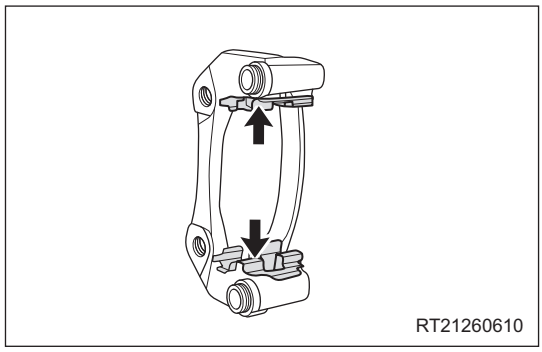
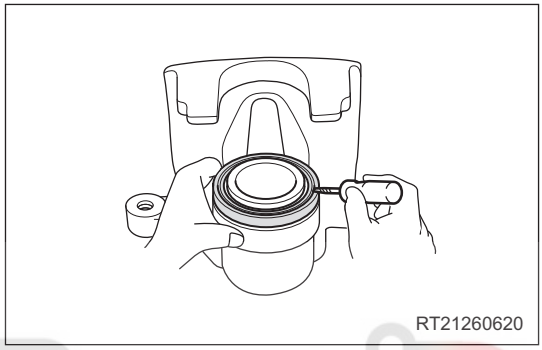
5. Remove the brake lining support gasket.
   a. Remove 2 brake lining support gaskets (arrow) from brake caliper fixing bracket.


RT21260610

6. Remove the brake cylinder dust boot.
   a. Using a flat tip screwdriver wrapped with protective tape, pry out the dust boot carefully.


RT21260620

CAUTION

- Be careful not to damage brake piston and brake cylinder.

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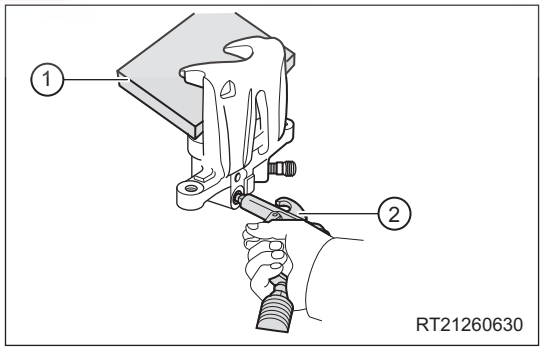
7. Remove the rear disc brake piston.
   a. Place a wooden board (1) between rear disc brake piston and rear disc brake cylinder.
   b. Use compressed air (2) to carefully press out the piston from rear disc brake cylinder through the attachment hole.



RT21260630

CAUTION

- Be careful not to splash brake fluid.
- DO NOT hold piston by hands to prevent injury.
- DO NOT remove or install brake piston casually, and always perform these operations by professional.

   c. Clean the piston bore with alcohol or proper solution. Then wipe it with a piece of lint.

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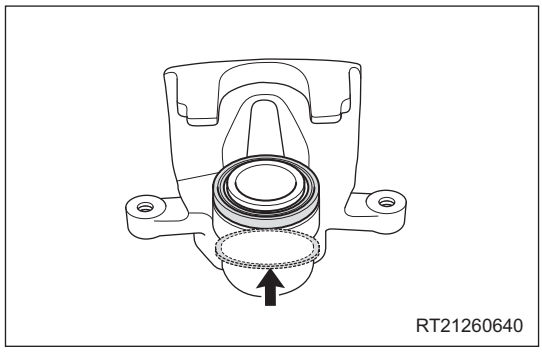
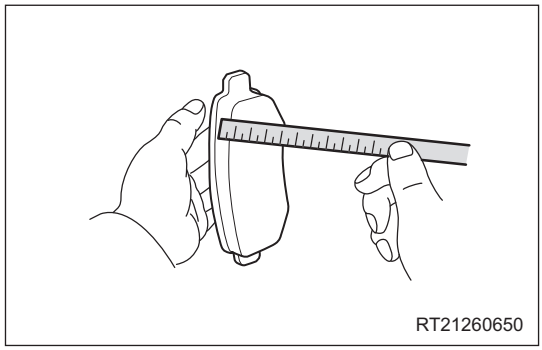
8. Remove the rear disc brake piston seal ring.
   a. Using a screwdriver wrapped with protective tape, carefully pry out the rear disc brake piston seal ring (arrow) from brake cylinder rear ring groove.



Inspection

1. Check brake cylinder and the piston.
   a. Check piston and bore for scratches or corrosion. If there are scratches or corrosion, remove them with fine sand cloth.
   b. Remove dirt on piston with a soft brass wire brush and coarse cloth. Do not clean the piston with polishing cloth or sand cloth, as this may damage its surface. If surface of piston is damaged, replace it. If piston is stuck or bore is worn or corroded, replace entire brake caliper assembly. Using polishing cloth to remove small corrosion points inside the bore.
2. Check brake caliper fixing bracket and brake caliper guide pin set.
   a. Clean the contact surface of brake caliper fixing bracket and brake lining support gasket with brake cleaner. Check for deformation, cracks, rust and foreign matter which is difficult to remove.
   b. Check brake caliper guide pin rubber dust boot for deformation, cracks, worn and foreign matter which is difficult to remove.
   c. Install brake caliper guide pin and brake caliper guide pin rubber dust boot to brake caliper fixing bracket. The brake caliper guide pin set should move smoothly without being stuck when pushing it with hand; otherwise replace it.
   d. After installing the brake lining, check if it is easy to fall out (due to insufficient elasticity of support gasket). Replace as necessary.
3. Check brake lining.
   a. Visually check brake lining for flatness, and also check for excessive wear. If condition of lining cannot be confirmed accurately only by visual inspection, a physical check will be used as necessary.
   b. Measure the minimum brake lining thickness. When the minimum thickness of brake lining is 2 mm or less, replace the brake lining.



   c. When replacing excessively worn brake linings (inner and outer), it is also necessary to replace linings on the opposite side of vehicle as well as unchecked linings to maintain proper braking performance. If it is unnecessary to replace brake linings, be sure to reinstall brake linings to the original positions.
4. Check brake disc.
   a. Minor scratch or wear on brake disc surface is acceptable. If severe scratch or deformation exists, the brake disc must be replaced.

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b. Excessive wear of brake disc may cause poor contact between brake lining and surface of brake disc. If protrusion on the disc is not removed before installing new brake lining, abnormal wear of brake disc will be caused.

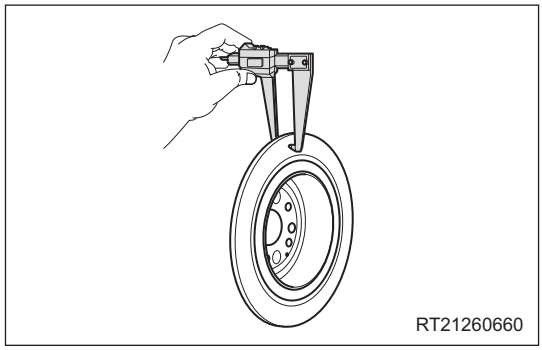
c. It is normal that the surface of brake disc is worn when replacing brake lining. If cracks or burned spots exist, the brake disc must be replaced.

5. Check brake disc thickness.

a. Using a vernier caliper, measure the brake disc thickness at the center of brake lining contact surface as shown in the illustration.

Standard thickness: 10 mm

Minimum thickness: 8 mm



b. If it is less than the minimum thickness due to wear of brake disc, replace brake disc.

CAUTION

- DO NOT machine brake disc, because it may make the brake disc thickness less than the minimum thickness.

Assembly

HINT:

- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

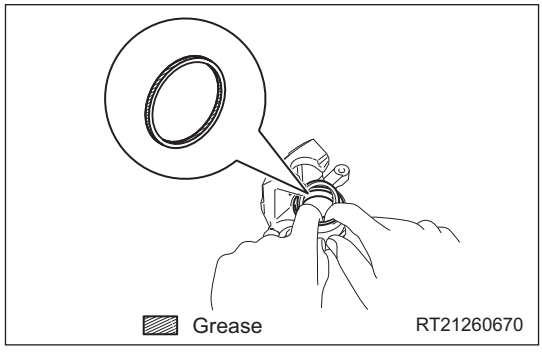
CAUTION

- When assembling brake caliper assembly, always keep your hands clean.
- When assembling brake caliper assembly, always use clean new brake fluid.
- Never use old seal ring for front disc brake piston.

1. Install the rear disc brake piston seal ring.

a. Apply a light coat of grease to entire inner and outer circumferences of new rear disc brake piston seal ring.

b. Install the rear disc brake piston seal ring onto the brake cylinder.



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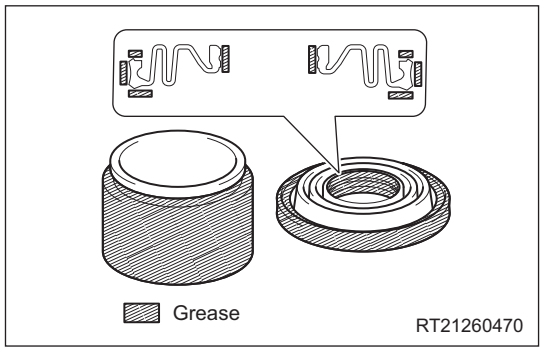
CAUTION

- Securely install rear disc brake piston seal ring into the rear ring groove of brake cylinder.

2. Install the rear disc brake piston.
   a. Apply a light coat of grease to the inner and outer circumferences, and entire periphery of outer flange top/bottom surfaces of new brake cylinder dust boot as shown in the illustration.
   b. Apply a light coat of grease to the entire outer circumference (part contacting with the brake cylinder dust boot and rear disc brake cylinder) of the rear disc brake piston.



   c. Install the brake cylinder dust boot onto the rear disc brake piston.
3. Install the brake cylinder dust boot.
   a. Install the rear disc brake piston to the rear disc brake cylinder.

CAUTION

- DO NOT install piston forcibly to brake cylinder.

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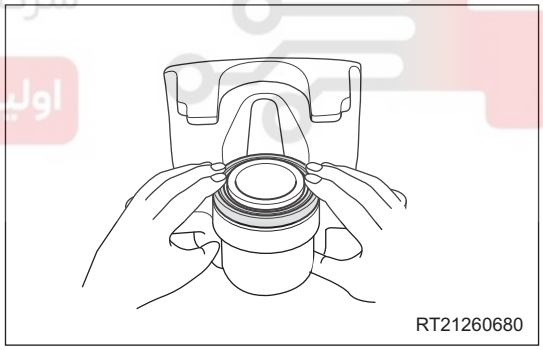
   b. Install the brake cylinder dust boot to the brake cylinder.



CAUTION

- Securely install brake cylinder dust boot into front ring groove of disc brake cylinder.
- DO NOT damage brake cylinder dust boot.

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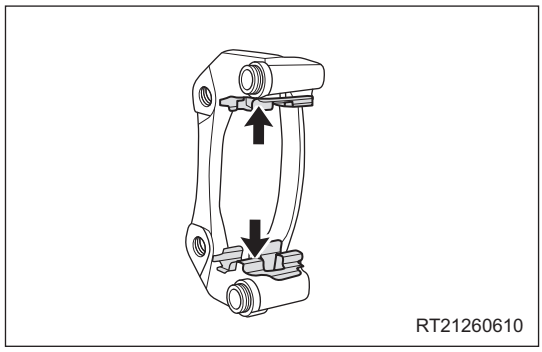
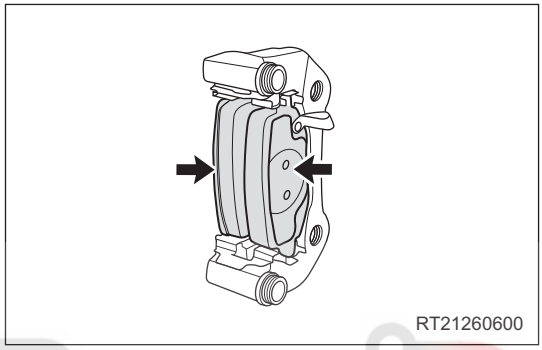
4. Install the brake lining support gasket.
   a. Securely install the upper and lower support gaskets onto the brake caliper fixing bracket.



5. Install the rear brake lining.
   a. Securely install the inner brake lining and outer brake lining (arrow) onto the brake caliper fixing bracket. Make sure they are clamped in place.



CAUTION

- Make sure the contact surface of lining and brake disc is free of oil and grease.

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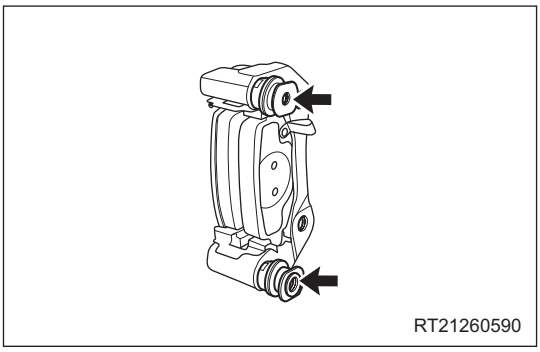
6. Install the rear brake caliper locating bolt guide pin (w/ dust boot).
   a. Apply a small amount of grease to the contact surface between locating bolt guide pins and guide pin rubber dust boots, and securely install the dust boots to the brake caliper fixing bracket.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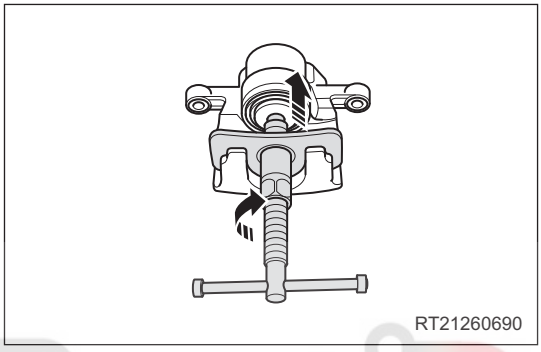
7. Install the brake cylinder assembly.
   a. Using brake cylinder piston pressing tool, slightly retract the brake cylinder piston (both sides).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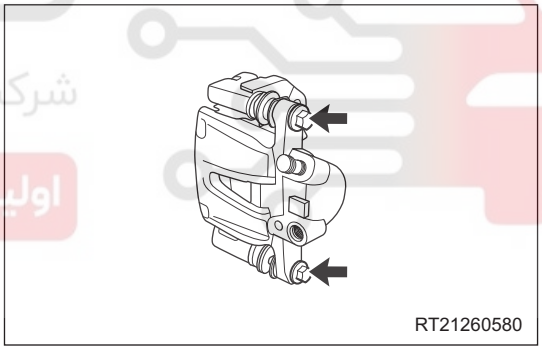
   b. Align the brake caliper locating bolts (arrow) with the guide pin hole and securely install the brake cylinder assembly.
   (Tightening torque: 25 ± 3 N·m)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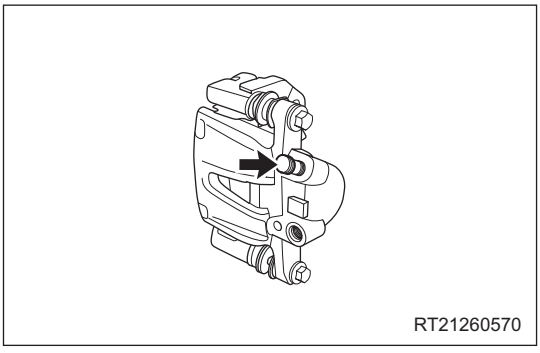
8. Install the bleeder plug (w/ bleeder plug cap).
   a. Securely install the bleeder plug (w/ bleeder plug cap) (arrow) to the rear brake caliper assembly.
   (Tightening torque: 9 - 11 N·m)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Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure to tighten fixing bolts and nuts to the specified torque during installation.
- Before installing brake linings, completely retract brake caliper piston back into the bore of brake caliper.
- Depress brake pedal several times to secure the brake linings to brake disc in order to ensure safety after installing the brake linings and before moving vehicle.
- Replace brake linings in pairs. DO NOT replace it alone.
- DO NOT install inner brake lining and outer brake lining reversely.
- Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.
- Be sure to perform bleeding procedures for brake system after installation.
- Be sure to add brake fluid to the proper level after installation.

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Rear Brake Hose Assembly

Removal

CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

HINT:
- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

1. Drain the brake fluid (See page 37-13).

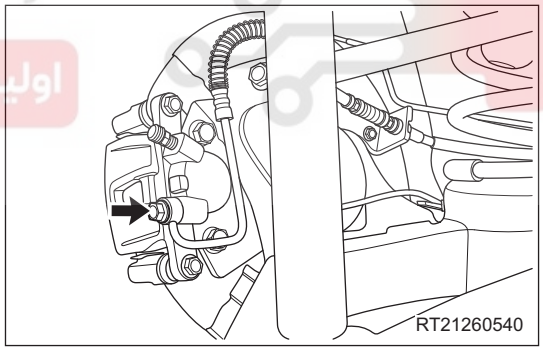
CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

2. Remove the rear left brake hose assembly.
   a. Remove the coupling bolt and washer (arrow) between rear left brake caliper assembly and rear left brake hose assembly.
   (Tightening torque: 20 ± 2 N·m)



CAUTION

- DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose, as the brake fluid is corrosive.

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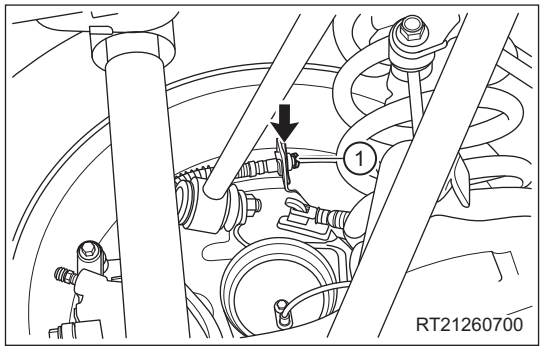
b. Disengage the fixing clamp (arrow) and loosen the coupling plug (1) between rear brake hose assembly and brake pipe.
(Tightening torque: 16 ± 2 N·m)



CAUTION

- DO NOT bend or damage brake tube.
- DO NOT allow any foreign matter such as dirt and dust to enter brake tube from joint parts.
- After removing brake line, perform sealing treatment to prevent foreign matter from entering.

c. Remove the rear brake hose assembly.

Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure to tighten bolt and plug in place.
- Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.
- Be sure to perform bleeding procedures for brake system after installation.
- Be sure to add brake fluid to the proper level after installation.

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PARKING BRAKE

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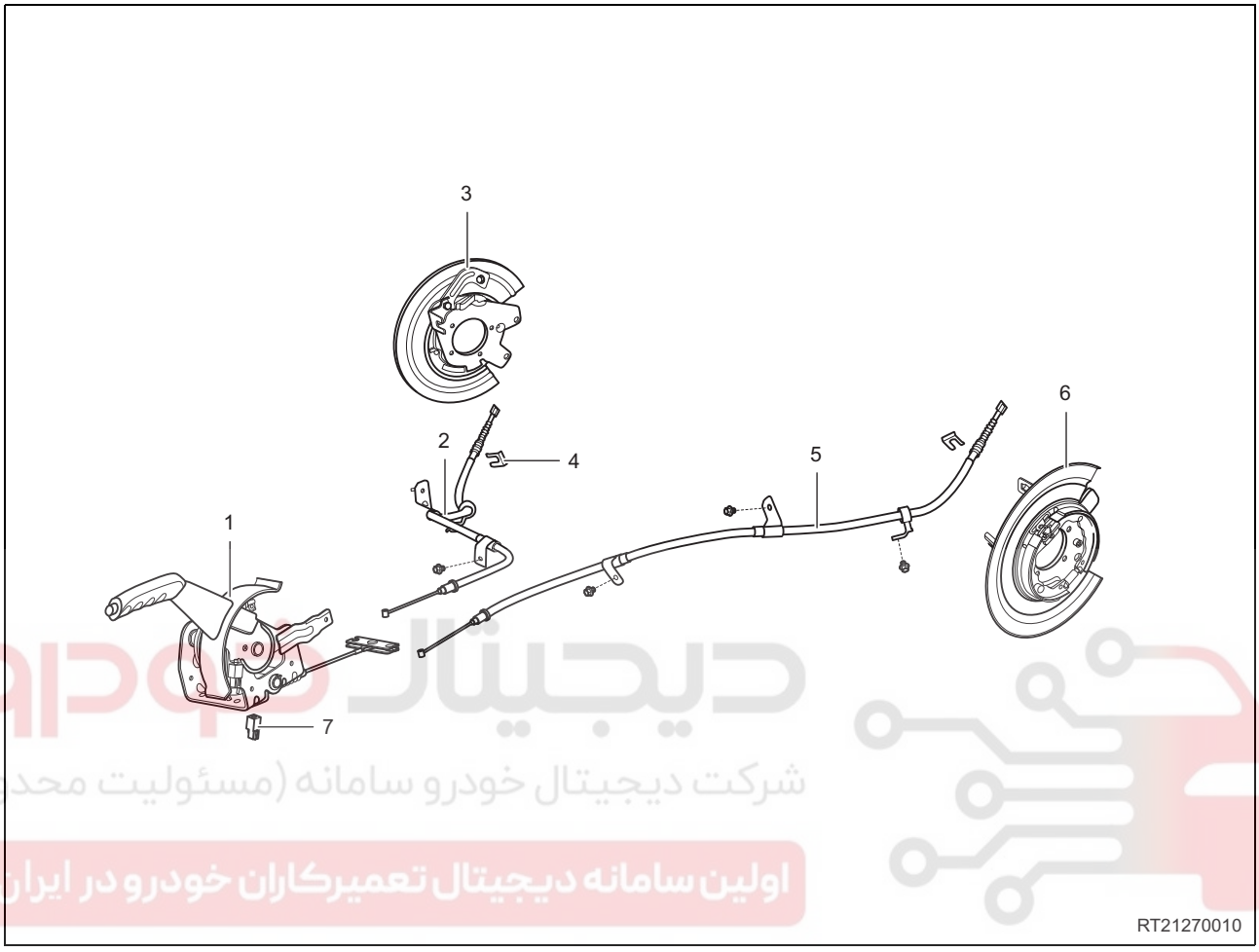
GENERAL INFORMATION

Parking Brake Assembly



1 - Parking Brake Control Mechanism Assembly	2 - Rear Right Parking Brake Cable Assembly
3 - Rear Right Brake Assembly	4 - Parking Brake Cable Fixing Clamp
5 - Rear Left Parking Brake Cable Assembly	6 - Rear Left Brake Assembly
7 - Parking Brake Switch Assembly	

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Description

All vehicles are equipped with a manual-operated parking brake control mechanism assembly, which is mounted on the center position of front seats. The tension balance block is built into parking brake control mechanism assembly. Each rear wheel has an individual parking brake rear cable assembly, which is respectively connected with the parking brake control mechanism assembly and rear brake shoe assembly. The parking brake cable is made of flexible wire.

Specifications

Torque Specifications

Description	Tightening Torque (N·m)
Wheel Mounting Bolt	110 ± 10
Coupling Bolt Between Parking Brake Control Mechanism Assembly and Body	23 ± 2
Coupling Bolt Between Parking Brake Rear Cable Assembly Fixing Bracket and Body	23 ± 2
Coupling Bolt Between Parking Brake Rear Cable Assembly Fixing Bracket and Rear Trailing Arm Assembly	23 ± 2
Coupling Bolt Between Parking Brake Rear Cable Assembly Fixing Bracket and Rear Brake Bottom Board Assembly	23 ± 2
Coupling Bolt Between Rear Brake Line Fixing Bracket and Rear Brake Bottom Board Assembly	23 ± 2

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

Rear DIH (Drum-in-hat)

Description	Standard Thickness (mm)	Minimum Thickness (mm)
Rear Brake Shoe Lining	3	1

Description	Standard Inner Diameter (mm)	Maximum Inner Diameter (mm)
Rear Brake Disc	186	188

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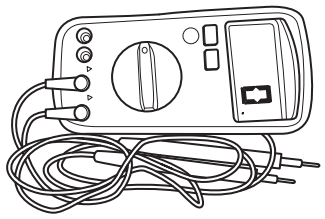
Tools

General Tools

Digital Multimeter	 RCH0000002
Vernier Caliper	 RCH0000019

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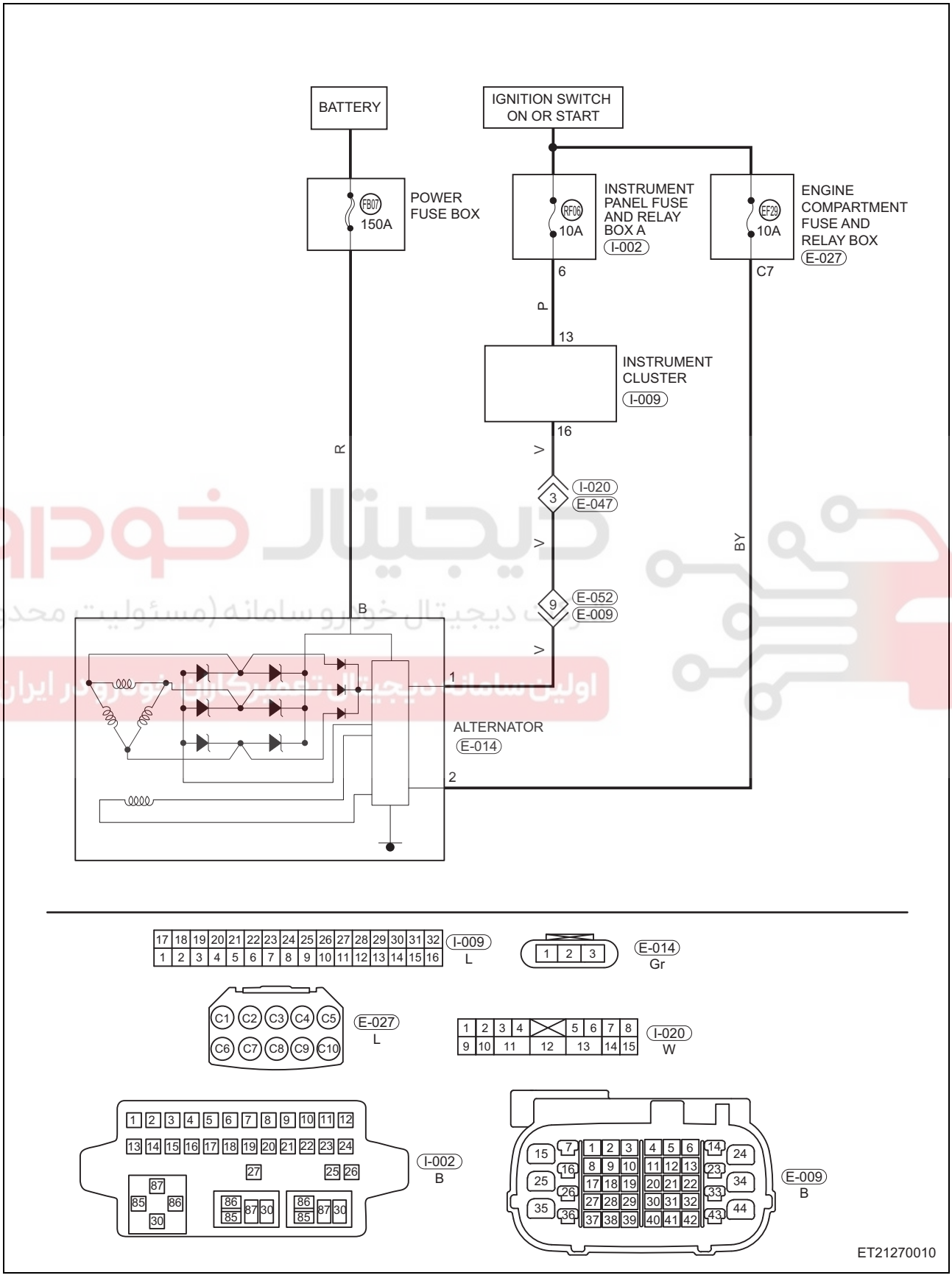
Circuit Diagram

Parking Brake System



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DIAGNOSIS & TESTING

Problem Symptoms Table

HINT:
Use the table below to help determine the cause of the problem symptoms. Check each suspected area in sequence. Repair or replace the faulty components, or adjust as necessary.

Symptom	Suspected Area	See page
Parking brake stuck	Parking brake control mechanism stroke (incorrect)	38-8
	Parking brake shoe clearance (incorrect)	38-8
	Parking brake shoe return tension spring (damaged)	38-17
Abnormal parking brake operation	Parking brake shoe (worn)	38-17
	Rear brake disc (excessively worn)	37-44
	Parking brake rear cable assembly (improperly fixed)	38-13
	Parking brake control mechanism assembly (improperly fixed)	38-16
	Parking brake control mechanism assembly (stuck)	38-11
Brake warning light does not come on when parking brake is applied	Warning light circuit (faulty)	38-9

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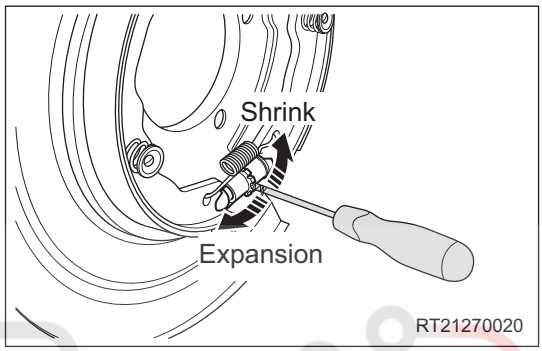
ON-VEHICLE SERVICE

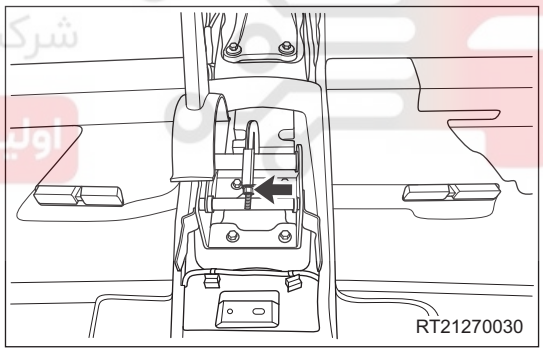
Adjustment

Abnormal parking brake operation may be caused by the worn brake shoe lining, incorrect brake shoe clearance adjustment, incorrect parking brake control mechanism stroke or incorrect parking brake component installation. Perform the following procedures to adjust the parking brake control mechanism stroke:

1. Support and raise the vehicle to a proper height.
2. Remove the rear wheel (See page 35-9).
3. Remove the rear brake disc (See page 37-44).
4. Remove the auxiliary fascia console assembly (See page 59-9).
5. Adjust the parking brake shoe clearance:
   a. Fully release the parking brake control mechanism.
   b. Using a flat tip screwdriver, pry off the brake shoe adjusting hole plug, rotate the brake shoe clearance adjustment mechanism assembly to adjust parking brake shoe clearance, and attempt to rotate the rear brake disc by hand to confirm that brake disc rotates freely.
   c. Check that there is no brake stuck for the brake shoe.



6. Adjust the parking brake control mechanism stroke:
   a. Fully release the parking brake control mechanism.
   b. Rotate the parking brake control mechanism adjustment nut, until the parking brake control mechanism stroke is correct.



   c. Correct judging method: after adjustment, fully release parking brake control mechanism and rotate rear wheel by hand.

      OK: Rear wheel can be rotated freely without dragging.

      Pull up parking brake control mechanism until 1 clicking sound is heard. There is resistance when rotating rear wheel by hand. Pull up parking brake control mechanism until 5 to 6 clicking sounds are heard and the rear wheel cannot rotate.
   d. When operating the parking brake control mechanism, check that brake warning light illuminates at the first click.

      OK: Parking brake warning light always illuminates at the first click.
   e. If result is not as specified, repeat above procedures until the parking brake control mechanism stroke is proper.
7. Install the auxiliary fascia console assembly (See page 59-9).
8. Install the rear brake disc (See page 37-44).
9. Install the rear wheel (See page 35-9).
   (Tightening torque: 110 ± 10 N·m)

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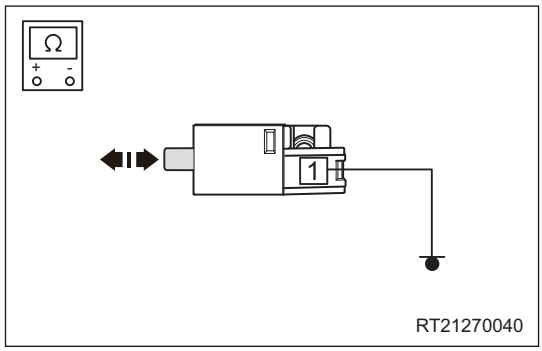
Parking Brake Switch Assembly

On-vehicle Inspection

1. Disconnect parking brake switch assembly connector, and check the continuity of parking brake switch assembly with ohm band of digital multimeter as shown in the table below.

   Standard Condition

Multimeter Connection	Condition	Specified Condition
Terminal 1 - Body ground	Parking brake applied (switch pin released)	Continuity
	Parking brake released (switch pin pushed)	No continuity



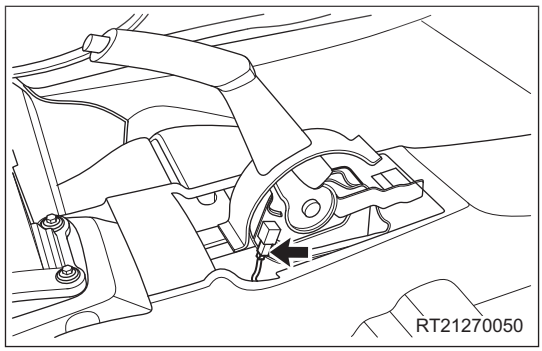
   If result is not as specified, replace parking brake switch assembly.

Removal

CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Fix the tire and wheel assembly.
2. Remove the auxiliary fascia console assembly (See page 59-9).
3. Remove the parking brake switch assembly.
   a. Disconnect the parking brake switch assembly wire harness connector (arrow) as shown in the illustration.



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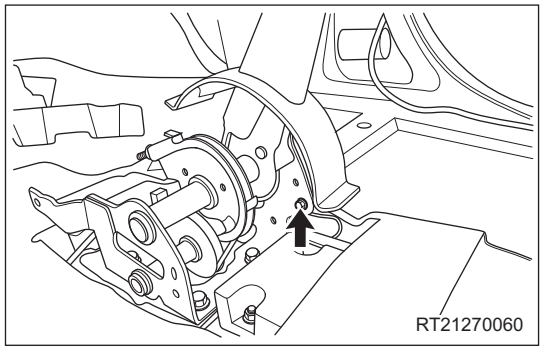
b. Using a cross screwdriver, loosen the fixing screw (arrow) of parking brake switch assembly.



c. Remove the parking brake switch assembly.

Inspection

1. Check parking brake switch assembly.
   a. Check parking brake switch assembly for wear or break. Replace parking brake switch assembly as necessary.
   b. Check if parking brake switch assembly compressed spring is damaged or weak elasticity. Replace parking brake switch assembly as necessary.

Installation

Installation is in the reverse order of removal.

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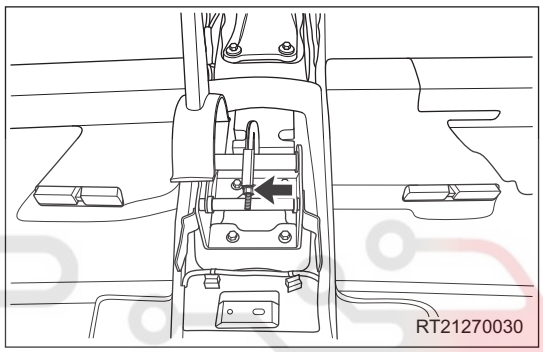
Parking Brake Control Mechanism Assembly

Removal

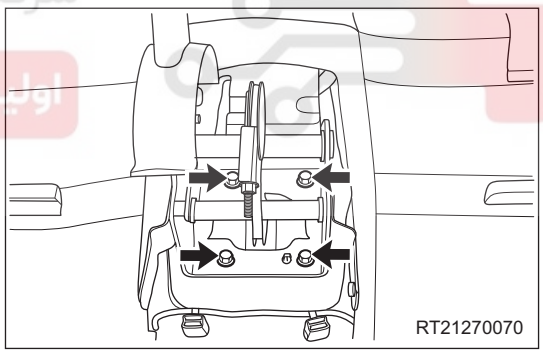
CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

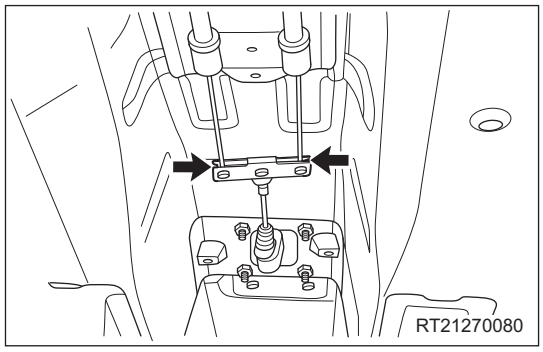
1. Fix the tire and wheel assembly.
2. Remove the auxiliary fascia console assembly (See page 59-9).
3. Remove the parking brake switch assembly (See page 38-9).
4. Remove the parking brake control mechanism assembly.
   a. Fully release the parking brake control mechanism.
   b. Loosen the locking nut (arrow) of parking brake control mechanism assembly to release the tension of parking brake cable assembly as shown in the illustration.



   c. Remove 4 coupling bolts (arrow) between parking brake control mechanism assembly and body.
   (Tightening torque: 23 ± 2 N·m)



   d. Disengage the parking brake rear cable assembly from two grooves (arrow) on the rear of parking brake control mechanism assembly.



   e. Remove the parking brake control mechanism assembly.

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Installation

Installation is in the reverse order of removal.

CAUTION

- Always tighten coupling bolts and nuts to the specified torque.

HINT:
Be sure to check parking brake control mechanism stroke after installing parking brake control mechanism assembly. Adjust parking brake control mechanism stroke to the proper position by adjusting parking brake control mechanism locking nut if necessary.

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Parking Brake Rear Cable Assembly

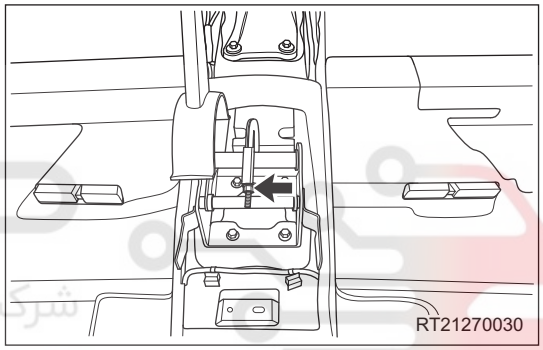
Removal

CAUTION

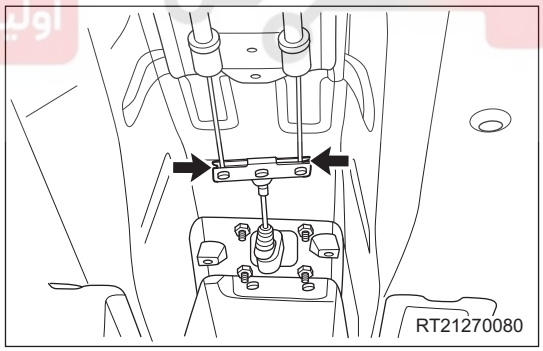
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

HINT:
- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

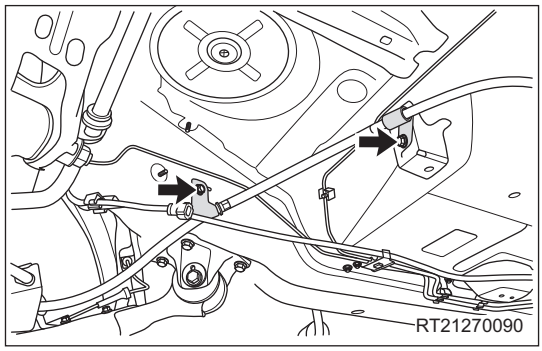
1. Remove the rear wheel (See page 35-9).
2. Remove the auxiliary fascia console assembly (See page 59-9).
3. Remove the parking brake rear cable assembly.
   a. Fully release the parking brake control mechanism.
   b. Loosen the locking nut (arrow) of parking brake control mechanism assembly to release the tension of parking brake cable assembly as shown in the illustration.



   c. Disengage the parking brake rear cable assembly from two grooves (arrow) on the rear of parking brake front cable assembly.



   d. Loosen the coupling bolts (arrow) between parking brake rear cable assembly fixing bracket and body, and disengage the cable fixing bracket.
   (Tightening torque: 23 ± 2 N·m)



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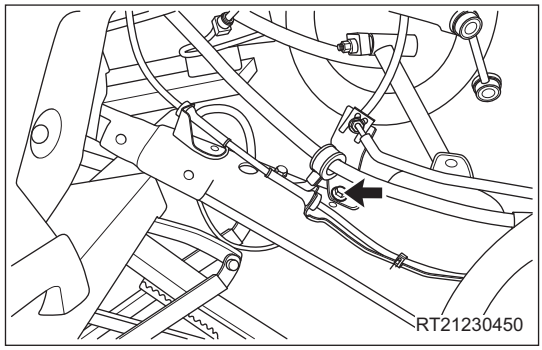
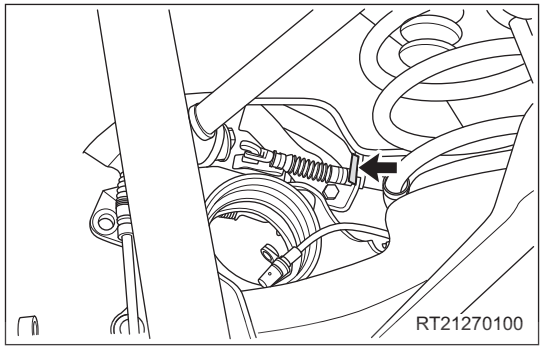
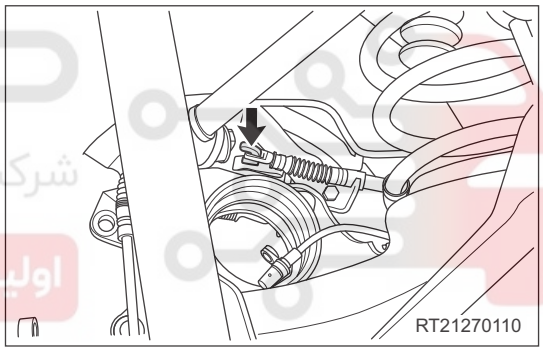
e. Loosen the coupling bolt (arrow) between parking brake rear cable assembly fixing bracket and rear trailing arm assembly, and disengage the cable fixing bracket.
(Tightening torque: 23 ± 2 N·m)



f. Remove the fixing clamp (arrow) and disengage the parking brake rear cable assembly from the fixing bracket.



g. Disengage the parking brake rear cable assembly end (arrow) from the parking brake pulling arm.



h. Remove the parking brake rear cable assembly.

Installation

Installation is in the reverse order of removal.

CAUTION

- Always tighten coupling bolts and nuts to the specified torque.
- During installation, make sure to align the positioning part of parking brake rear cable assembly fixing bracket and the positioning hole on body.

HINT:
Parking brake should be adjusted after replacing brake shoe or parking brake cable assembly. Check if parking brake functions properly after adjustment is completed.

- Fully pull up parking brake control mechanism.
- Release parking brake control mechanism and check if rear wheels rotate freely.
- If wheels are difficult to rotate freely, repeat adjustment procedures.
- After driving for a period of time, parking brake control mechanism stroke should be readjusted because of wear of rear brake shoe linings.

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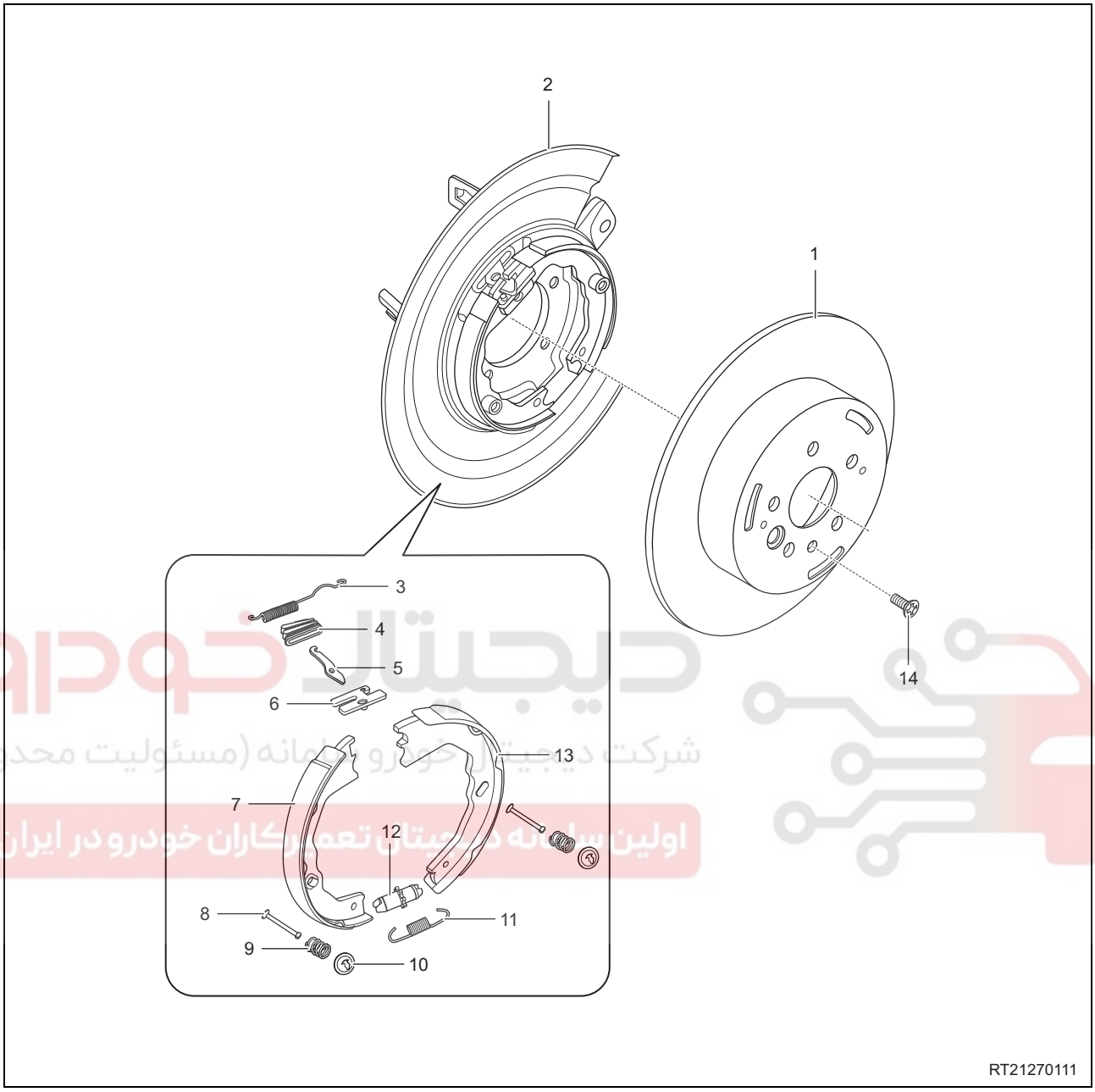
Rear Brake Assembly



1 - Rear Brake Disc	2 - Rear Brake Assembly
3 - Brake Shoe Return Tension Spring (Upper)	4 - Parking Pulling Arm Dust Boot
5 - Parking Pulling Arm	6 - Parking Push Rod
7 - Left Parking Brake Shoe Lining	8 - Compressed Spring Tie Rod
9 - Brake Shoe Compressed Spring	10 - Compressed Spring Seat
11 - Brake Shoe Return Tension Spring (Lower)	12 - Brake Shoe Clearance Adjustment Mechanism Assembly
13 - Right Parking Brake Shoe Lining	14 - Rear Brake Disc Positioning Screw

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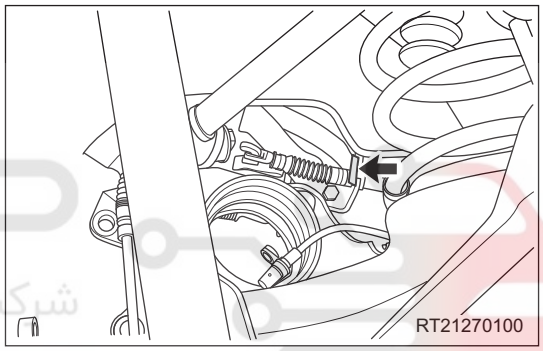
Removal

CAUTION

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

HINT:
- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

1. Remove the rear left wheel (See page 35-9).
2. Remove the rear left brake caliper assembly (See page 37-44).
3. Remove the rear left brake disc (See page 37-44).
4. Remove the rear left hub bearing unit (See page 33-22).
5. Remove the rear left brake assembly.
   a. Fully release the parking brake control mechanism.
   b. Remove the fixing clamp (arrow) and disengage the parking brake rear cable assembly from the fixing bracket.



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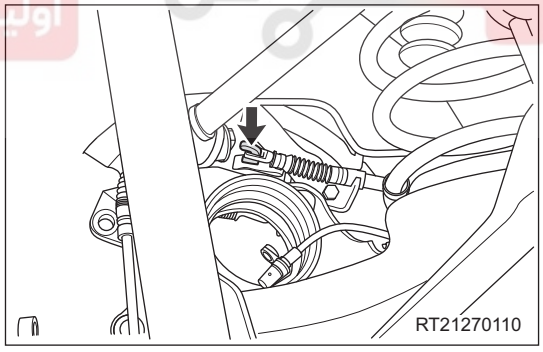
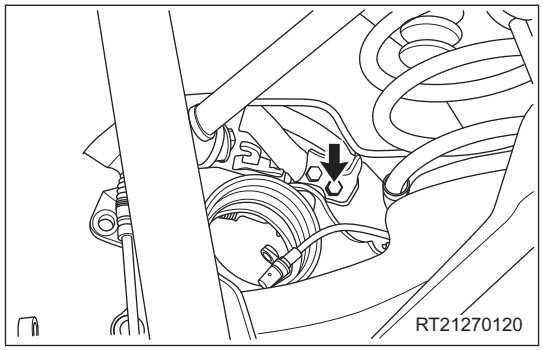
   c. Disengage the parking brake rear cable assembly end (arrow) from the parking brake pulling arm.



   d. Remove the coupling bolt (arrow) between parking brake rear cable assembly fixing bracket and rear brake bottom board assembly.
   (Tightening torque: 23 ± 2 N·m)



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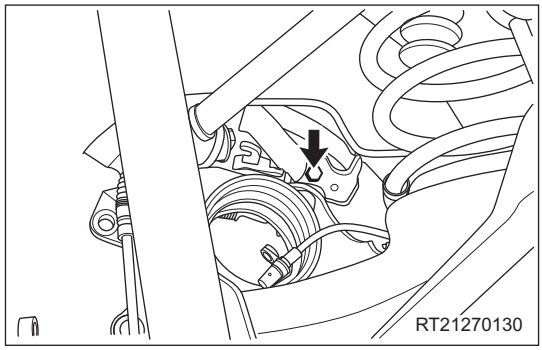
e. Remove the coupling bolt (arrow) between rear brake line fixing bracket and rear brake bottom board assembly.
(Tightening torque: 23 ± 2 N·m)



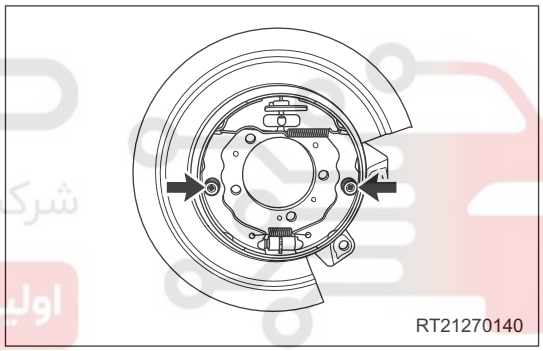
f. Remove the rear left brake assembly.

CAUTION

- DO NOT touch interior ornament when removing steering column with intermediate shaft assembly to avoid scratching the interior ornament.

Disassembly

1. Remove the brake shoe stopper spring set.
   a. Using needle-nose pliers, press brake shoe compressed spring and rotate compressed spring tie rod to remove the stopper spring sets (arrow) on both sides as shown in the illustration.



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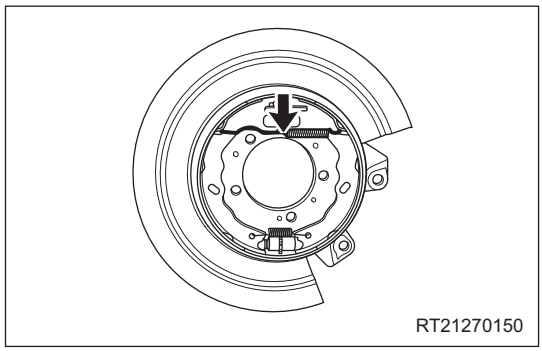
2. Remove the brake shoe return tension spring (upper).
   a. Using needle-nose pliers, remove the brake shoe return tension spring (upper) carefully as shown in the illustration.



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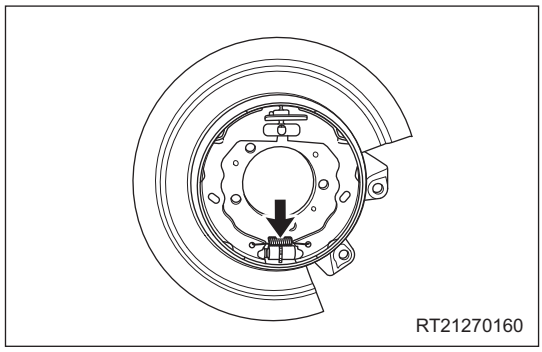
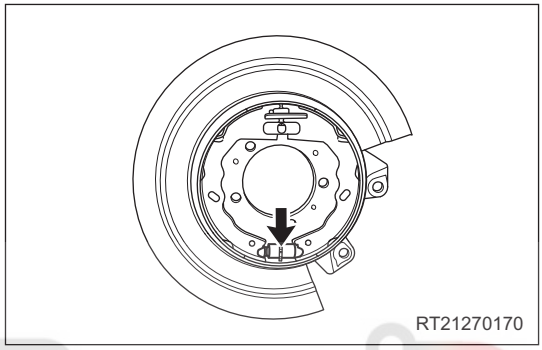
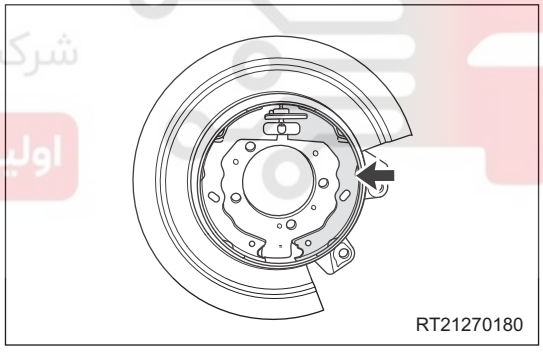
3. Remove the brake shoe return tension spring (lower).
   a. Using needle-nose pliers, remove the brake shoe return tension spring (lower) carefully as shown in the illustration.



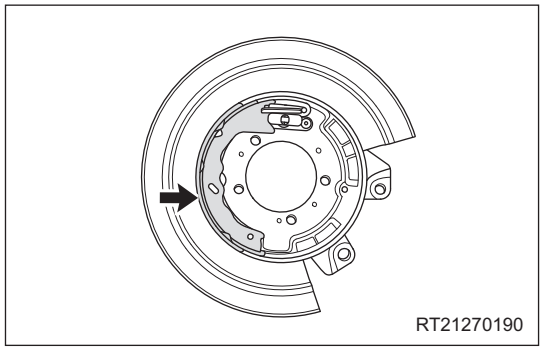
4. Remove the brake shoe clearance adjustment mechanism assembly.
   a. Disengage the brake shoe linings on both sides and remove the clearance adjustment mechanism assembly as shown in the illustration.



5. Remove the right brake shoe lining.
   a. Disengage the right brake shoe lining from the parking push rod as shown in the illustration.



6. Remove the left brake shoe lining.
   a. Disengage the left brake shoe lining from the parking push rod as shown in the illustration.



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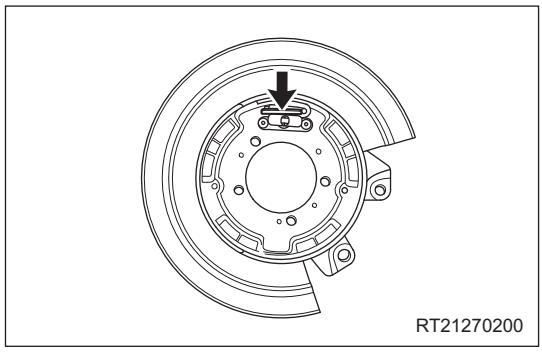
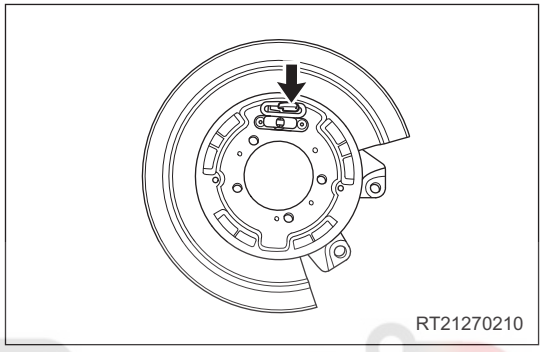
7. Remove the parking push rod.
   a. Disengage the parking push rod from the parking pulling arm as shown in the illustration.


RT21270200

8. Remove the parking pulling arm.
   a. Remove the parking pulling arm from the parking pulling arm dust boot as shown in the illustration.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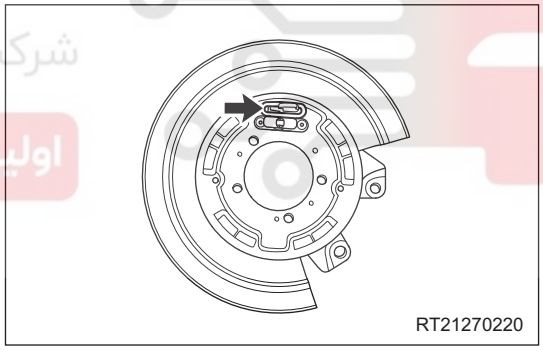
9. Remove the parking pulling arm dust boot.
   a. Disengage the parking pulling arm dust boot from the rear brake bottom board assembly as shown in the illustration.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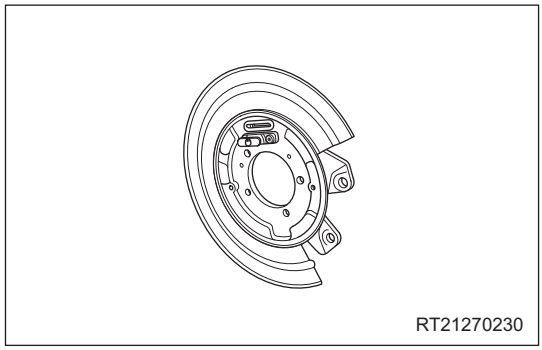
10. Remove the rear brake bottom board assembly.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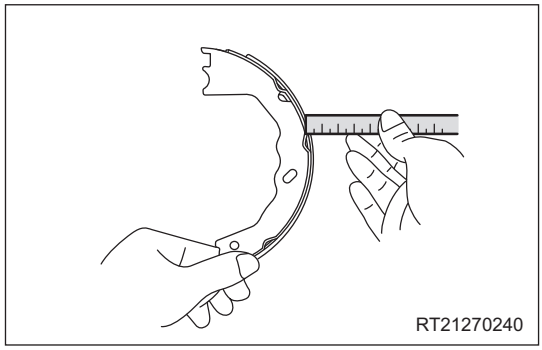
Inspection

1. Check the thickness of brake shoe lining.
   a. Using a ruler, measure the thickness of brake shoe lining as shown in the illustration.
      Standard thickness: 3 mm
      Minimum thickness: 1 mm

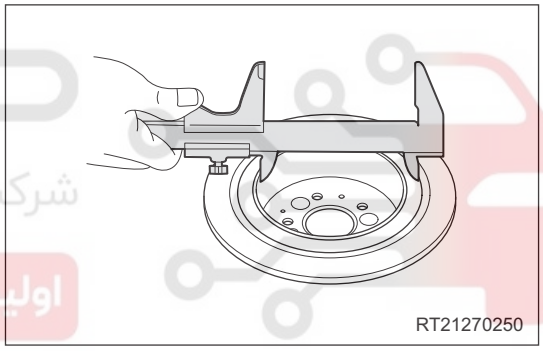


   b. If thickness of brake shoe lining is equal to or less than the minimum value, replace brake shoe lining.

CAUTION

- Replace brake shoe linings in pairs. DO NOT replace it alone.

2. Check the rear brake disc inner diameter.
   a. Using a vernier caliper or equivalent, measure rear brake disc inner diameter.
      Standard inner diameter: 186 mm
      Maximum inner diameter: 188 mm



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   b. If rear brake disc inner diameter is more than the maximum value, replace rear brake disc.
3. Check other components.
   a. Check if brake shoe return tension spring (upper) is broken, bent, damaged or elasticity is weak. Replace as necessary.
   b. Check if brake shoe return tension spring (lower) is broken, bent, damaged or elasticity is weak. Replace as necessary.
   c. Check if parking push rod and pulling arm is broken, bent or damaged. Replace as necessary.
   d. Check if parking pulling arm dust boot is worn, cracked or dirty. Replace as necessary.
   e. Check if brake shoe stopper spring set is broken, bent, damaged or elasticity is weak. Replace as necessary.
   f. Check if brake shoe clearance adjustment mechanism assembly is struck, damaged or slides off. Replace as necessary.

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Assembly

Assembly is in the reverse order of disassembly.

CAUTION

- Adjust brake shoe clearance to the proper position by brake shoe clearance adjustment mechanism assembly after installation is completed.

Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure to tighten fixing bolts and nuts to the specified torque during installation.
- Make sure to install fixing clamp in place.

HINT:
Parking brake should be adjusted after replacing parking brake shoe. Check if parking brake functions properly after adjustment is completed.

- Fully pull up parking brake control mechanism.
- Release parking brake control mechanism and check if rear wheels rotate freely.
- If wheels are difficult to rotate freely, repeat adjustment procedures.
- After driving for a period of time, parking brake control mechanism stroke should be readjusted because of wear of rear brake shoe linings.

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